E 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648-XC074]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Tillamook South Jetty Repairs in Tillamook Bay, Oregon

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; proposed incidental harassment authorizations; request for comments on proposed authorizations and possible renewals.

SUMMARY: NMFS has received a request from the U.S. Army Corps of Engineers (USACE) – Portland District (Corps) for authorization to take marine mammals incidental to 2 years of activity associated with Tillamook South Jetty Repairs in Tillamook Bay, Oregon. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue two one-year incidental harassment authorizations (IHAs) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on a possible one-time, one-year renewal for each IHA that could be issued under certain circumstances and if all requirements are met, as described in **Request for Public Comments** at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorization and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than [*INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER*].

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service and should be submitted via email to *ITP.renytysonmoore@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will generally be posted online at *www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act* without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Reny Tyson Moore, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the "take" of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq*.) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are proposed or, if the taking is limited to harassment, a notice of a proposed IHA is provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other "means of effecting the least practicable adverse impact" on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as "mitigation"); and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth.

The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our proposed actions (*i.e.*, the issuance of two IHAs) with respect to potential impacts on the human environment.

These actions are consistent with categories of activities identified in Categorical Exclusion B4 (IHAs with no anticipated serious injury or mortality) of the Companion Manual for NOAA Administrative Order 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has preliminarily determined that the issuance of the proposed IHAs qualifies to be categorically excluded from further NEPA review.

We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the IHA requests.

Summary of Request

On February 11, 2022, NMFS received a request from the Corps for two one-year IHAs to take marine mammals incidental to repairs of the Tillamook South Jetty in Tillamook Bay, Oregon. The application was deemed adequate and complete on May 23, 2022. The Corps' request is for take of five species of marine mammals by Level B harassment and, for a subset of these species (*i.e.*, harbor seals (*Phoca vitulina richardii*), northern elephant seals (*Mirounga angustriostris*), and harbor porpoises (*Phocoena phocoena*)), take by Level A harassment. Neither the Corps nor NMFS expect serious injury or mortality to result from this activity and, therefore, IHAs are appropriate.

Description of Proposed Activity

Overview

The Corps constructed, and continues to maintain, two jetties at the entrance of Tillamook Bay, Oregon to provide reliable navigation into and out of the bay. A Major Maintenance Report (MMR) was completed in 2003 to evaluate wave damage to the jetties and provide design for necessary repairs. Some repairs to the North Jetty were completed in 2010, and further repairs to the North Jetty root and trunk began in January 2022. The Tillamook South Jetty Repairs Project (*i.e.*, the "proposed activities") would complete critical repairs to the South Jetty, as described in the MMR, with a focus on rebuilding the South Jetty head. Work would consist of repairs to the existing structures within the original jetty footprints (*i.e.*, trunk repairs and the construction of a 100-foot cap to repair the South Jetty Head), with options to facilitate land- and water-based stone transport, storage, and placement operations. A temporary material offload facility (MOF), which would be approximately 15 meters (m) (50 feet (ft)) by 30 m (100 ft), would be constructed to transfer jetty rock from barges to shore at the South Jetty.

The two IHAs requested by the Corps would be associated with the construction (Year 1 IHA) and removal (Year 2 IHA) of the temporary MOF. Construction of the MOF would involve vibratory (preferred) and/or impact pile driving of up to 10 12-inch H piles, 24 24-inch timber or steel pipe piles, and 250 24-inch steel sheets (type NZ, AZ, PZ, or SCZ), and is anticipated to occur during the first year of the project (November 1, 2022 through October 31, 2023). Removal of the MOF would involve vibratory extraction of all installed piles and sheets and is anticipated to occur between November 1, 2024 and October 31, 2025. The Corps proposed work windows are between November and February and between July and August each year to adhere to terms and conditions outlined in the U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BiOp) to minimize potential take of the Western snowy plover (WSP), currently listed as threatened under the Endangered Species Act (ESA). Sounds resulting from pile installation and removal from these proposed activities may result in the incidental take of marine mammals by Level A and Level B harassment.

Dates and Duration

Completion of the South Jetty repairs is anticipated to take multiple construction seasons. The primary in-water sound effects would be associated with construction (Year 1 IHA) and deconstruction (Year 2 IHA) of a MOF at Kincheloe Point. MOF construction/deconstruction would only occur during the aforementioned work windows and when weather conditions would not restrict watercraft operations or compromise crew safety. The Corps anticipates commencing work in the autumn of 2022. Construction of the MOF is anticipated to take 20 to 23 days and to occur between November 1, 2022 and February 15, 2023 or between July 1, 2023 and August 31, 2023. Deconstruction of the MOF is estimated to take 13 days and is anticipated to occur between November 1, 2024 and February 15, 2025 or between July 1, 2025 and August

31, 2025. The Corps plans to conduct pile driving only during daylight hours (from sunrise to sunset).

Specific Geographic Region

Tillamook Bay is located on the Oregon Coast near the city of Garibaldi in Tillamook County, Oregon (Figure 1). The Bay is protected from the open ocean by shoals and a sandbar called the Bayocean Peninsula. It is generally very shallow, with depths ranging from 0.3 to 2.1 m (1 to 7 ft) throughout most of the Bay, but reaching depths of up to 10 m (32 ft) in the South, Main, and Bay City Channels. The sediment in Tillamook Bay consists primarily of sand or mud, and there are several sea grass beds present in the region. Tillamook Bay provides a safe harbor for the water-dependent economies of local and state entities. It is the third largest bay in Oregon and sustains significant biological and economic resources. The proposed activities would be located on the Bayocean Split, Tillamook County, Oregon (Tillamook Bay, River Mile 1; Section 18, 19, and 20 of Township 1N, Range 10W; Latitude: 45.565500, Longitude: -123.948983).

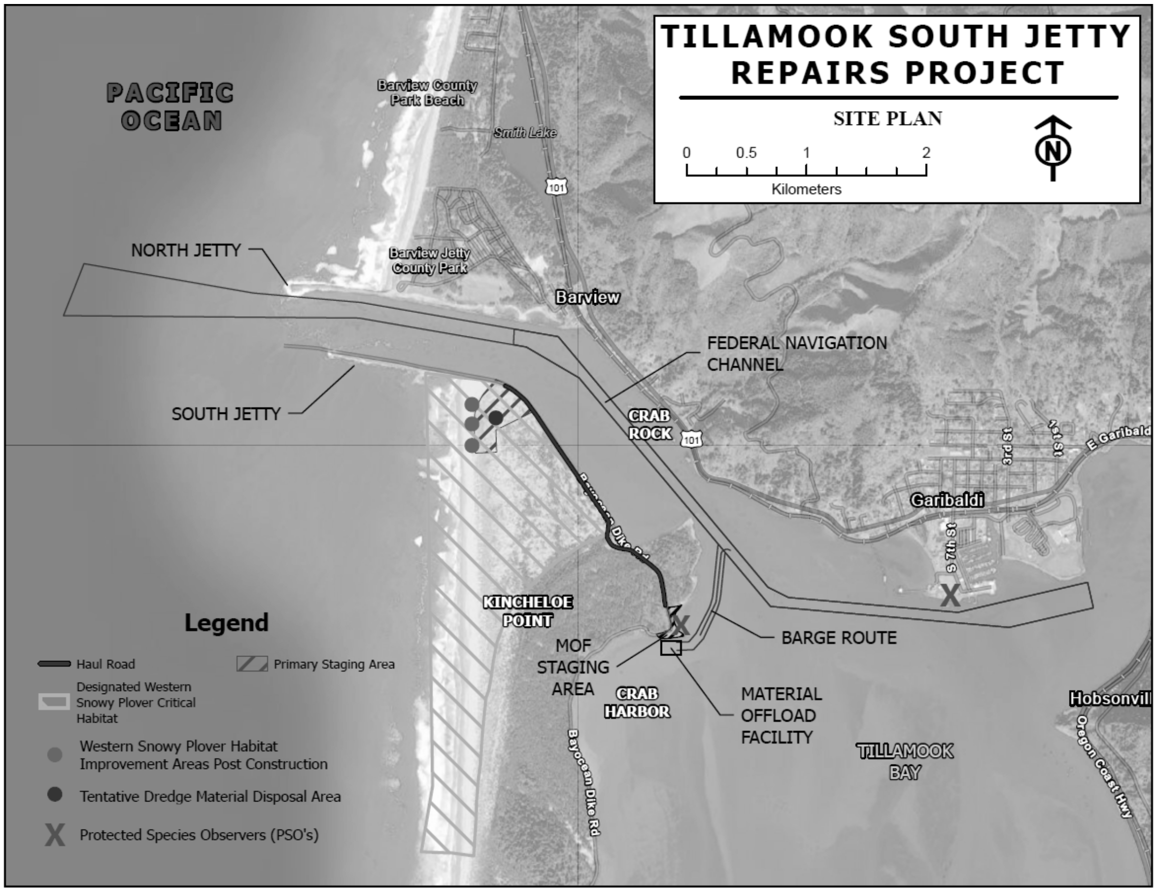

Figure 1. Overview of Proposed Activity Elements and Wetland Features at the South Jetty

The Port of Garibaldi is located approximately 3.2 kilometers (km) (2 miles (mi)) east of the entrance to Tillamook Bay and contains a lumber mill, seafood processing plants, marine repair shops, a commercial and charter fishing marina, and a public boat launch. The United States Coast Guard (USCG) Station Tillamook Bay is also located at the Port of Garibaldi; operations include towing vessels and assisting recreational and commercial boaters throughout the year with five search and rescue boats. The U.S. Highway 101 corridor is adjacent to Tillamook Bay, passing through the coastal cities of Bay City, Garibaldi, and Barview closest to the South Jetty (see Figure 1-1 in the Corps' application). The nearest residences to the proposed activity area are located in Barview, approximately 610 m (2,000 ft) away on the opposite side of the entrance channel.

Detailed Description of Specific Activity

The purpose of the proposed activities is to protect the structural integrity of the Tillamook South Jetty and to improve navigation conditions at the channel entrance through major maintenance repair activities. As with most jetties along the Oregon coast, the Tillamook South Jetty was constructed to facilitate safe navigation and support a more stable entrance channel at the mouth of Tillamook Bay. It was constructed in phases between 1969 and 1979 to a final length of 2,046 m (8,025 ft). The South Jetty currently has a total length that is approximately 320 m (1,050 ft) shorter than the authorized footprint, and the head is severely damaged with an estimated recession rate of approximately 8.5 m (28 ft) per year. As with the Tillamook North Jetty, there has also been erosion of the jetty trunk. No repairs have occurred since the original construction. The 2003 MMR report and subsequent 2014 Corps inspection recommended several repair actions that are the basis for the proposed construction activities. Repair activities would consist of two main components at the South Jetty: trunk repairs and construction of a 30 m (100-ft) cap to repair the South Jetty head.

In addition to stone placement at the South Jetty head and trunk, related construction activities associated with these repairs, specifically the delivery and storage of new stone, include the construction of a temporary MOF near Kincheloe Point; channel dredging to maintain access to MOF; roadway improvements and possible turnouts along Bayocean Dike Road; and utilization of two upland staging and stockpiling areas: one primary staging area adjacent to the South Jetty trunk and a smaller staging area near the MOF. The Contractor will ultimately decide on the means and methods for construction, within these constraints and the conditions outlined in the proposed IHAs. Given uncertainty about which features will be implemented to facilitate site access, the Corps' application assumes a temporary MOF, which requires pile driving, would be constructed to accommodate barge operations. The proposed activities also include removal and site restoration for each of the temporary construction features upon project completion. As discussed in further detail below, NMFS assumes that take of marine mammals is likely to result only from pile driving activities conducted as part of the MOF construction/removal and not from activities related to the delivery, storage, or placement of jetty stone.

Construction Staging Areas

Jetty repairs and associated construction elements require areas for equipment and supply staging and storage, parking areas, access roads, scales, general yard requirements, and jetty stone stockpile areas. There would be one primary staging area adjacent to the South Jetty trunk and a smaller staging area near the MOF (Figure 1). Temporary erosion controls would be put in place before any alteration of the sites. An Erosion and Sediment Control Plan (ESCP) would outline facilities and Best Management Practices (BMPs) that would be implemented and installed prior to any ground-disturbing activities on the project site, including mobilization. These erosion controls would prevent pollution caused by surveying or construction operations and ensure sediment-laden water do not leave the project site, enter Tillamook Bay, or impact aquatic and terrestrial wildlife.

Ocean barging is anticipated to be the primary method of material and equipment transport; however, Bayocean Dike Road (Figure 1) would be used to access the staging areas and work sites. Prior to construction, the road would be improved to facilitate the necessary level of construction traffic. Specific details and locations of road improvement actions would depend on the condition of the road at the start of construction, however any improvements or alterations would avoid wetlands and waters of the U.S. to the maximum extent practicable. Roadway improvements would also avoid any locations identified as having significant cultural resources.

There are no known pinnipeds haul-outs on the sites proposed for these staging areas or near the proposed access roads (see **Description of Marine Mammals in the**

Area of Specified Activities). Therefore, upland activities related to the development of the staging areas and access roads are not anticipated to impact any marine mammal species, and are not considered further in our analysis.

Temporary Material Offloading Facility

A temporary MOF is needed to transfer jetty rock from barges to shore at the South Jetty. The MOF would provide moorage for barges and a structure for crane support. The preferred location of the MOF is on the south side of Kincheloe Point, on the site of a former staging area (Figure 1). Detailed design of the MOF would be completed closer to the time of construction. The discussion below is based on general assumptions about likely design elements. These assumptions represent a conservative scenario for purposes of analysis.

The offloading platform could require the use of an anchor line moorage or dolphins. The platform would be approximately 15 m (50 ft) by 30 m (100 ft) and would be constructed using a sheet pile perimeter wall, installed using a vibratory hammer. A maximum of 24, 24-inch timber or steel piles would be installed as mooring dolphins, up to 10, 12-inch steel H-piles will be installed for support, and up to 250, 24-inch steel sheets (type NZ, AZ, PZ, or SCZ) would be driven for the perimeter wall. The maximum pile diameter would be 24 inches, and caps (or other deterrence devices) would be installed on each pile to discourage birds from perching. The platform would be constructed within the confines of the perimeter wall by filling in the area with backfill. The H-piles would be shoreward of installed sheets and most likely driven into the fill material with very little water, if any. A contractor would be limited by these general constraints, but the final MOF design would be per their discretion, largely based on site conditions, material availability, and cost. The MOF would be sited to avoid direct impacts to eelgrass during construction. In-water noise incidental to vibratory and impact pile driving of the MOF is anticipated to result in Level A harassment and/or Level B harassment.

Vibratory hammers are the preferred method of pile installation. However, impact driving may be required for steel pipe piles if vibratory means prove infeasible (impact pile driving would not be required for any other pile type). For any impact driving of steel piles, a confined bubble curtain will be used to reduce in-water sound. Pile driving to construct the MOF is anticipated to take 20 (vibratory installation methods only) to 23 (vibratory and impact installation methods) days over the course of a month (Table 1) and would occur under the first IHA (Year 1). Multiple piles would not be driven concurrently. Vibratory hammers would be used to remove the temporary MOF and is anticipated to take an additional 13 days over the course of a month (Table 1). Deconstruction would occur under the second IHA (Year 2).

Table 1. Summary of Pile Details and Estimated Effort Required for the Construction and Deconstruction of the Temporary MOF

Pile Type	Size	Number of Sheets/ Piles	Vibratory Installation Duration Per Pile/Sheet (minutes)	Vibratory Removal Duration Per Pile/Sheet (minutes)	Potential Impact Strikes per Pile, if Needed	Production Rate (piles/day)			Range of Installation Days Anticipated[1]		Range of Vibratory Removal Days Anticipated[1]
						Installation (Vibratory)	Installation (Impact)	Removal (Vibratory)	Vibratory Only	Vibratory and Impact	
AZ Steel Sheet[2]	24-inch	250	10	3	--	25	--	50	10 – 12	10 – 12	5 – 7
Timber or Steel Pile	24-inch	24	15	5	533	8	4	12	3 – 6	6 – 9	2 – 4
H-Pile	12-inch	10	10	3	--	10	--	10	1 – 2	1 – 2	1 – 2
Project Totals		284	49.83 hours	16.17 hours	--	--	--	--	14 – 20	17 – 23	8 – 13

[1]The minimum days of installation and removal are based on the expected production rates. The maximum days of installation and removal are estimated assuming built in contingency days, which have been added into the construction schedule, are needed.
[2]Or comparable

Dredging

In order to allow fully loaded barges to access the MOF, dredging would occur prior to the construction of the platform. Based on the conditions at the preferred MOF location, it is conservatively estimated that no more than 5,000 cubic yards of material would be dredged. The barge route from the main channel to the MOF will be sited to avoid potential adverse effects to eelgrass to the maximum extent practicable. The area dredged would include the area adjacent to the shore where the barge would be moored (see Figure 1-4 in the Corps' application). Sandy dredged material removed to facilitate barge access would be placed in the Primary Staging Area as indicated in Figure 1-3 in the Corps' application and used to fill depressions and create better habitat for WSP post construction.

The scope and duration of dredging would be limited to the minimum area and amount of time needed to achieve project purposes. Initial MOF dredging would take approximately one week to complete, and will occur between July 15 and March 15 to avoid the peak timing for juvenile coho salmon outmigration. Ongoing maintenance will occur as needed. Only mechanical dredging would be permissible, and dredges would be operated to limit dredge spillover.

The Corps will work to meet state water quality standards. To minimize water turbidity and the potential for entrainment of organisms during dredging for the MOF, the clamshell bucket or head of the dredge would remain on the bottom to the greatest extent possible and only be raised 1 m (3 ft) off the bottom when necessary for dredge operations. Turbidity levels will be monitored via visual observations to identify any adverse detectable change in water quality. A hand-held turbidity meter will be deployed and used during MOF dredging and fill activities. No more than 10 percent cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction, or other legitimate activities and which cause the standard to be exceeded may occur provided all practicable turbidity control techniques have been applied. See Oregon Administrative Rules (OAR) 340-041-0036.

While dredging may produce underwater noise above the relevant harassment threshold (*i.e.*, between 150 and 180 dB; Clark *et al.*, 2002; Miles *et al.*, 1986), the noise produced by dredging is similar to other common on-and in-water industrial activities typically occurring in the area. Additionally, dredging will only occur in a relatively small and confined area of Tillamook Bay over a short duration of time (*i.e.*, 5 days), limiting the potential for impacts. Therefore, incidental takes of marine mammals are not anticipated or proposed to be authorized for dredging activities, and this activity is not considered further in our analysis.

South Jetty Maintenance and Repairs

Significant repairs are proposed along the South Jetty, where the majority of work would occur from STA 70+00 westward. These stations are enumerated in 30 m (100-ft) increments such that STA 71+00 would be 30 m (100 ft) seaward from STA 70+00. Additional repairs to the jetty trunk between Stations 43+00 and 49+00 are also planned. The jetty cap will be from STA 77+00 to 77+75 to elevation + 5.5 m (18 ft) relative to North American Vertical Datum of 1988 (NAVD88). From the final head station centerline, the end of the jetty will be built out in a 6 m (20 ft) radius to elevation + 5.5 m (18 ft) NAVD88. The crest width of the jetty cap would be 12 m (40 ft). The crest width of the jetty trunk would be 9 m (30 ft) with a target crest elevation of + 5.5 m (18 ft) NAVD88. The average stone density would be approximately 180 pounds (lbs)/ft^3, and the total quantity of stone required for the proposed activities is estimated at 31,000 cubic yards (~76,000 tons). Stone placement at the South Jetty would take just under 150 working days.

While placement of jetty stone could produce noise, NMFS has determined that sounds produced from this action would not exceed marine mammal thresholds beyond 10 m (33 ft) from the source in the water and beyond 100 m (328 ft) from the source in the air (86 FR 22151; April 27, 2021). There are no known pinniped haul-outs or other known important marine mammal habitats within the vicinity of the South Jetty (see **Description of Marine Mammals in the Area of Specified Activities**) limiting the potential for impacts from stone placement. Therefore, incidental takes of marine mammals are not anticipated or proposed to be authorized for jetty stone placement, and are not considered further in our analysis.

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see **Proposed Mitigation** and **Proposed Monitoring and Reporting**).

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history of the potentially affected species. NMFS fully considered all of this information, and we refer the reader to these descriptions, incorporated here by reference, instead of reprinting the information. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SARs; *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS' website (*https://www.fisheries.noaa.gov/find-species)*.

Table 2 lists all species or stocks for which take is expected and proposed to be authorized for these activities, and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS' SARs). While no serious injury or mortality is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS' stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS' U.S. Pacific SARs (*e.g.*, Carretta *et al*. 2021) or Alaska SARs (*e.g.*, Muto et al. 2020). All values presented in Table 2 are the most recent available at the time of publication and are available in the 2020 SARs (Carretta *et al*. 2021, Muto *et al*., 2020) and draft 2021 SARs (available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports*).

Table 2. Species Likely Impacted by the Specified Activities

Common name	Scientific name	MMPA Stock	ESA/MMPA status; Strategic (Y/N)[1]	Stock abundance Nbest, (CV, N_{min}, most recent abundance survey)[2]	PBR	Annual M/SI[3]
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Phocoenidae (porpoises)						
Harbor Porpoise	*Phocoena phocoena*	Northern OR/WA Coast	-,-, N	21,487 (0.44; 15,123; 2011)	151	≥3.0
Order Carnivora – Superfamily Pinnipedia						
Family Otariidae (eared seals and sea lions)						

California sea lion	*Zalophus californianus*	U.S.	-,-, N	257,606 (N/A.; 233,515; 2014)	14,011	>320
Steller sea lion	*Eumetopias jubatus*	Eastern	-,-, N	43,201 (N/A; 43,201; 2017)	2,592	112
Family Phocidae (earless seals)						
Harbor seal	*Phoca vitulina richardii*	OR/CA Coastal	-, N	24,732 (0.12; N/A; 1999)	UND	10.6
Northern elephant seal	*Mirounga angustirostris*	California Breeding	-,-, N	187,386 (N/A; 85,369; 2013)	5,122	5.3

[1] - Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.
[2]- NMFS marine mammal stock assessment reports online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments.* CV is coefficient of variation; N_{min} is the minimum estimate of stock abundance. In some cases, CV is not applicable (N.A.).
[3] - These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.*, commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.

As indicated above, all 5 species (with 5 managed stocks) in Table 2 temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur. All species (26 marine mammal species and 27 marine mammal stocks) that could potentially occur in the proposed survey areas are included in Table 3-3 of the Corps' application. The majority of the species listed in the Corps' table are unlikely to occur in the project vicinity. For example, numerous cetaceans (*i.e.*, sei whale, *Balaenoptera borealis borealis*; fin whale, *Balaenoptera physalus physalus*; Risso's dolphin, *Grampus griseus*; common bottlenose dolphin, *Tursiops truncatus truncatus*; striped dolphin, *Stenella coeruleoalba*; common dolphin, *Delphinus delphis*; short-finned pilot whale, *Globicephala macrorhynchus*; Baird's beaked whale, *Berardius bairdii*; Mesoplodont beaked whale, *Mesoplodon spp.*; Cuvier's beaked whale, *Ziphius cavirostris*; pygmy sperm whale, *Kogia breviceps*; dwarf sperm whale, *Kogia sima*; sperm whale, *Physeter macrocephalus*) are only encountered at the continental slope (> 20 km/12 mi offshore) or in deeper waters offshore and would not be affected by construction activities. Other species may occur closer nearshore but are rare or infrequent seasonal inhabitants off the Oregon coast (*i.e*., minke whale, *Balaenoptera acutorostrata scammoni*; Pacific white-sided dolphin, *Lagenorhynchus obliquidens*; Northern right-whale dolphin, *Lissodelphis borealis*; killer whale, *Orcinus orca* ("Eastern North Pacific Southern Resident Stock"); Dall's porpoise, *Phocoenoides dalli dalli*). Given these considerations, the temporary duration of potential pile driving, and noise isopleths that would not extend beyond the bay entrance (please see **Estimated Take)**, there is no reasonable expectation for the proposed activities to affect the above species and they will not be addressed further.

While ten marine mammal species could occur in the vicinity of the proposed project activities (*i.e.*, harbor seals; Northern elephant seal; Steller sea lion; California sea lion; humpback whales, *Megaptera novaeangliae*; fin whales, *Balaenoptera physalus physalus*; gray whales, *Eschrichtius robustus*; blue whales, *Balaenoptera musculus musculus*; killer whales, *Orcinus orca*; and harbor porpoises), Tillamook Bay is relatively shallow and noise resulting from the construction/deconstruction of the MOF would be limited to the interior waters of the bay and would not extend to coastal waters. Larger whales (*e.g.*, humpback whales, fin whales, gray whales, blue whales, killer whales) may transit the waters near the coastline but are unlikely inhabitants of Tillamook Bay itself. In reviewing OBIS-SEAMAP (2022) and records for all marine mammals recorded within a 16 km (10 mi) radius of Tillamook Bay, only humpback whales, gray whales, harbor porpoises, California sea lions, Steller sea lions, and harbor seals were commonly reported. Killer whales have only been seen on rare occasions (TinyFishTV, 2014; rempeetube, 2016; Corey.c, 2017), and Dall's porpoise (and northern right whale dolphins have been reported a bit further offshore (Halpin *et al*., 2009; OBIS-SEAMAP, 2022). Gray whales and humpback whales have been observed in the vicinity of Tillamook Bay, however, they are highly unlikely to enter the relatively shallow waters of Tillamook Bay and be subject to pile driving noise disturbance. Given these considerations, take of these species (*i.e.*, humpback whales, fin whales, gray whales, blue whales, killer whales) is not expected to occur, and they are not discussed further beyond the explanation provided here.

Harbor Porpoise

In the Pacific Ocean, harbor porpoise are found in coastal and inland waters from Point Conception, California to Alaska and across to Kamchatka and Japan (Gaskin, 1984). Six harbor porpoise stocks have been designated off California/Oregon/Washington, based on genetic analyses and density discontinuities identified from aerial surveys. While harbor porpoise are rare within Tillamook Bay, if present, animals likely belong to the Northern Oregon/Washington Coast stock, which is delimited from Cape Flattery, Washington (located approximately 320 km (198 mi) north of Tillamook Bay), to Lincoln City, Oregon (located approximately 68 km (42 mi) south of Tillamook Bay) (Carretta *et al.,* 2022).

Entanglement is the primary cause of human-related injury and death for harbor porpoises, however, estimated fishery mortality and serious injury rates are well below PBR. Harbor porpoises are sensitive to disturbance by a variety of anthropogenic sound sources, and the limited range of several U.S. West Coast harbor porpoise stocks makes them particularly vulnerable to potential impacts (see overview in Forney *et al*., 2017).

Harbor porpoises on the Pacific Northwest coast of the United States are typically found in waters roughly 100-200 m (328-656 ft) deep (NOAA, 2013a; Holdman *et al.* 2018). They occur along the Oregon coast year-around and may be slightly more abundant in summer and exhibit diel or tidal movement patterns related to prey availability (Holdman *et al.,* 2018). Harbor porpoises have been detected within a 16 km

(10 mi) radius of the Tillamook Bay entrance channel (Halpin *et al*., 2009; OBIS-SEAMAP, 2022), and they could potentially occur in the project vicinity during the proposed activities.

California Sea Lion

California sea lions are distributed along the North Pacific waters from central Mexico to southeast Alaska, with breeding areas restricted primarily to island areas off southern California (the Channel Islands), Baja California, and in the Gulf of California (Carretta *et al*., 2021). There are five genetically distinct geographic populations. The population seen in Oregon is the Pacific Temperate population (which comprises the U.S. stock managed by NMFS), which are commonly seen in Oregon from September through May (ODFW, 2015).

The occurrence of the California sea lion along the Oregon coast is seasonal with lowest abundance in Oregon in the summer months, from May to September, as they migrate south to the Channel Islands in California to breed. They are commonly found in Oregon haul-out sites from September to May and during this period, adult and subadult males have been observed in bays, estuaries, and offshore rocks along the Oregon coast. In fact, a few males have been reported in Oregon waters throughout the year (Mate, 1973). The population breeds in the California Channel Islands and most females and young pups remain in that region year-around (Mate, 1973).

The California sea lion stock has been growing steadily since the 1970s. The stock is estimated to be approximately 40 percent above its maximum net productivity level (MNPL = 183,481 animals), and it is therefore considered within the range of its optimum sustainable population (OSP) size (Laake *et al*., 2018). The stock is also near its estimated carrying capacity of 275,298 animals (Laake *et al*., 2018). However, there remain many threats to California sea lions including entanglement, intentional kills, harmful algal blooms, and climate change. For example, for each 1 degree Celsius increase in sea surface temperature (SST), the estimated odds of survival declined by 50 perfect for pups and yearlings, while negative SST anomalies resulted in higher survival estimates (DeLong *et al.*, 2017). Such declines in survival are related to warm oceanographic conditions (*e.g.*, El Niño) that limit prey availability to pregnant and lactating females (DeLong *et al*., 2017). Changes in prey abundance and distribution have been linked to warm-water anomalies in the California Current that have impacted a wide range of marine taxa (Cavole *et al*., 2016), including California sea lions. For example, between 2013 and 2017, NOAA declared an unusual mortality event (UME) for California sea lions as high mortality of pup and juvenile age classes were documented during this time. NOAA identified changes in the availability of sea lion prey species, particularly sardines, as a contributing factor.

California sea lions may occur in the project vicinity, but there have been no confirmed sightings in Tillamook Bay (Halpin *et al*., 2009; OBIS-SEAMAP, 2022). The closest known haul out site is at Three Arch Rock, which is approximately 23 km (14 mi) south of the proposed site of the MOF.

Steller Sea lion

The Steller sea lion range extends along the Pacific Rim, from northern Japan to central California. For management purposes, Steller sea lions inhabiting U.S. waters have been divided into two DPS: the Western U.S. and the Eastern U.S. Steller sea lions encountered off the Oregon coast are part of the Eastern U.S. Stock, with rookeries in California, Oregon, Washington, Southeast Alaska, and British Columbia (Muto *et al*., 2021). The Western U.S. stock of Steller sea lions are listed as endangered under the ESA and depleted and strategic under the MMPA. The Eastern U.S. stock (including those living in Oregon) was de-listed in 2013 following a population growth from 18,040 in 1979 to 70,174 in 2010 (an estimated annual growth of 4.18 percent) (NMFS, 2013). A population growth model indicates the eastern stock of Steller sea lions increased at a rate of 4.25 percent per year (95 percent confidence intervals of 3.77-4.72 percent) between 1987 and 2017 based on an analysis of pup counts in California, Oregon, British Columbia, and Southeast Alaska (Muto *et al*., 2021). This stock is likely within its OSP; however, no determination of its status relative to OSP has been made (Muto *et al*., 2021).

Off the Oregon coast, Steller sea lions have been observed ashore from the Columbia River south to Rogue Reef and typically inhabit offshore rocks and islands. There are seven major haul-out sites noted in Oregon during the breeding season, however, there are no known rookery sites near Tillamook Bay (Pitcher *et al*., 2007). The closest known haul out site is at Three Arch Rock, which is approximately 23 km (14 mi) south of the proposed site of the MOF. Steller sea lions have been detected in Tillamook Bay during marine mammal surveys (Pearson and Verts, 1970; Halpin *et al*., 2009; Ford *et al*., 2013) and may occur in the vicinity of the project.

Harbor Seal

Harbor seals inhabit coastal and estuarine waters off Baja California, north along the western coasts of the continental U.S., British Columbia, and Southeast Alaska, west through the Gulf of Alaska and Aleutian Islands, and in the Bering Sea north to Cape Newenham and the Pribilof Islands (Caretta *et al.*, 2021). Within U.S. west coast waters, five stocks of harbor seals are recognized: 1) Southern Puget Sound (south of the Tacoma Narrows Bridge); 2) Washington Northern Inland Waters (including Puget Sound north of the Tacoma Narrows Bridge, the San Juan Islands, and the Strait of Juan de Fuca); 3) Hood Canal; 4) Oregon/Washington Coast; and 5) California. Seals potentially affected by this activity would be part of the Oregon/Washington Coast stock.

Harbor seals generally are non-migratory, with local movements associated with tides, weather, season, food availability, and reproduction (Scheffer and Slipp, 1944; Fisher, 1952; Bigg 1969, 1981). Harbor seals do not make extensive pelagic migrations, though some long distance movement of tagged animals in Alaska (900 km, 559 mi) and along the U.S. west coast (up to 550 km, 342 mi) have been recorded (Brown and Mate, 1983; Herder, 1986; Womble, 2012). Harbor seals have displayed strong fidelity to haulout sites (Pitcher and Calkins, 1979; Pitcher and McAllister, 1981).

Harbor seals were historically hunted in Oregon as a nuisance to fishermen, however, their numbers have steadily increased since the passage of the MMPA in 1972 (Harvey, 1987; Brown *et al.*, 2005). While harbor seals are still subject to incidental take from commercial fisheries in the region, overall mortality is relatively low. However, the most recent abundance estimate available for this stock dates to 1999 (Carretta *et al.*, 2021).

Harbor seals are one of the most abundant pinnipeds in Oregon and can typically be found in coastal marine and estuarine waters of the Oregon coast throughout the year. On land, they can be found on offshore rocks and islands, along shore, and on exposed flats in the estuary (Harvey, 1987). There is one haul-out site roughly 1.5 km (0.9 mi) east of the proposed MOF that has been historically noted in Tillamook Bay. This haul-out is located on an intertidal sand flat in the middle of the bay (See Figure 4-1 in the Corps' application) and highest utilization has been observed during the May/June reproductive season (B.E. Wright, personal communication, February 12, 2021; ODFW, 2022). This is consistent with other findings noting harbor seals being more abundant in Tillamook Bay during the summer pupping season (Brown and Mate, 1983). There is also evidence that animals may move between Netarts Bay, a prominent feeding site located approximately 15 km (9 mi) south of Tillamook Bay, and Tillamook Bay in the non-pupping season (Brown and Mate, 1983). Therefore, harbor seals are expected to occur in the vicinity of the project.

Northern Elephant Seal

The California Breeding Stock of Northern elephant seals breeds and gives birth in California and makes extended foraging trips to areas including coastal Oregon biannually during the fall and spring (Le Boeuf *et al.,* 2000). While both males and females may transit areas off the Oregon coast, males seem to have focal forage areas near the continental shelf break while females typically move further offshore and feed opportunistically at numerous sites while in route (Le Beouf *et al*., 2000).

Populations of northern elephant seals in the U.S. and Mexico have recovered after being nearly hunted to extinction (Stewart *et al*., 1994). Northern elephant seals underwent a severe population bottleneck and loss of genetic diversity when the population was reduced to an estimated 10-30 individuals (Hoelzel *et al*., 2002). Although movement and genetic exchange continues between rookeries, most elephant seals return to natal rookeries when they start breeding (Huber *et al.,* 1991). The California breeding population is now demographically isolated from the Baja California population. No international agreements exist for the joint management of this species by the U.S. and Mexico. The California breeding population is considered to be a separate stock (Carretta *et al.,* 2022).

The population is currently susceptible to incidental take and injury from gillnet and trawl fisheries operating offshore, however, the human-caused mortality is still well below the estimated PBR level.

There have been no recorded sightings of northern elephant seals in the immediate vicinity of Tillamook Bay, however, there have been sightings toward Netarts Bay, located approximately 14 km (9 mi) south of the Tillamook South Jetty, and further offshore (Halpin *et al*., 2009; OBIS-SEAMAP, 2022). Therefore, northern elephant seals could transit the area.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007, 2019) recommended that marine mammals be divided into hearing groups based on directly measured (behavioral or auditory evoked potential techniques) or estimated hearing ranges (behavioral response data, anatomical modeling, etc.). Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 3.

Table 3. Marine Mammal Hearing Groups (NMFS, 2018).

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, *Kogia*, river dolphins, Cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz
* Represents the generalized hearing range for the entire group as a composite (*i.e.*, all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al*., 2007) and PW pinniped (approximation).	

The pinniped functional hearing group was modified from Southall *et al*. (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al*., 2006; Kastelein *et al*., 2009; Reichmuth and Holt, 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information.

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The **Estimated Take** section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The **Negligible Impact Analysis and Determination** section considers the content of this section, the **Estimated Take** section, and the **Proposed Mitigation** section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and whether those impacts are reasonably expected to, or reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival

Acoustic effects on marine mammals during the specified activity can occur from impact and vibratory pile driving. The effects of underwater noise from the Corps' proposed activities have the potential to result in Level A and Level B harassment of marine mammals in the action area.

Description of Sound Sources

This section contains a brief technical background on sound, on the characteristics of certain sound types, and on metrics used in this proposal inasmuch as the information is relevant to the specified activity and to a discussion of the potential effects of the specified activity on marine mammals found later in this document. For general information on sound and its interaction with the marine environment, please see, *e.g.*, Au and Hastings (2008); Richardson *et al*. (1995); Urick (1983).

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in hertz (Hz) or cycles per second. Wavelength is the distance between two peaks or corresponding points of a sound wave (length of one cycle). Higher frequency sounds have shorter wavelengths than lower frequency sounds, and typically attenuate (decrease) more rapidly, except in certain cases in shallower water. Amplitude is the height of the sound pressure wave or the "loudness" of a sound and is typically described using the relative unit of the dB. A sound pressure level (SPL) in dB is described as the ratio between a measured pressure and a reference pressure (for underwater sound, this is 1 microPascal (μPa)), and is a logarithmic unit that accounts for large variations in amplitude; therefore, a relatively small change in dB corresponds to large changes in sound pressure. The source level represents the SPL referenced at a distance of 1 m from the source (referenced to 1 μPa), while the received level is the SPL at the listener's position (referenced to 1 μPa).

Root mean square (RMS) is the quadratic mean sound pressure over the duration of an impulse. RMS is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick, 1983). RMS accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper, 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak pressures.

Sound exposure level (SEL; represented as dB referenced to 1 micropascal squared per second (re 1 μPa^2-s)) represents the total energy in a stated frequency band over a stated time interval or event, and considers both intensity and duration of exposure. The per-pulse SEL is calculated over the time window containing the entire pulse (*i.e.*, 100 percent of the acoustic energy). SEL is a cumulative metric; it can be accumulated over a single pulse, or calculated over periods containing multiple pulses. Cumulative SEL (SELcum) represents the total energy accumulated by a receiver over a defined time window or during an event. Peak sound pressure (also referred to as zero-to-peak sound pressure or 0-pk) is the maximum instantaneous sound pressure measurable in the water at a specified distance from the source, and is represented in the same units as the RMS sound pressure.

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in a manner similar to ripples on the surface of a pond and may be either directed in a beam or beams or may radiate in all directions (omnidirectional sources), as is the case for sound produced by the pile driving activity considered here. The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound, which is defined as the all-encompassing sound in a given place and is usually a composite of sound from many sources both near and far (ANSI, 1995). The sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.*, wind and waves, earthquakes, ice, atmospheric sound), biological (*e.g.*, sounds produced by marine mammals, fish, and invertebrates), and anthropogenic (*e.g.*, vessels, dredging, construction) sound. A number of sources contribute to ambient sound, including wind and waves, which are a main source of naturally occurring ambient sound for frequencies between 200 Hz and 50 kilohertz (kHz) (Mitson, 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Precipitation can become an important component of total sound at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times. Marine mammals can contribute significantly to ambient sound levels, as can some fish and snapping shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz. Sources of ambient sound related to human activity include transportation (surface vessels), dredging and construction, oil and gas drilling and production, geophysical surveys, sonar, and explosions. Vessel noise typically dominates the total ambient sound for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly.

A recent study of ambient ocean sound for Oregon's nearshore environment observed maximum and minimum levels of 136 dB re 1 μPa and 95 dB re 1 μPa, respectively, with an average level of 113 dB re 1 μPa over a period of one year (Haxel *et al*., 2011). This level could vary given the presence of different recreational and commercial vessels (*e.g.*, up to 150 dB for small fishing vessels (Hildebrand, 2005), up to 186 dB for large vessels, 81 to 166 dB for empty tugs and barges and up to 170 dB for loaded tugs and barges (Richardson *et al*., 1995) within the frequencies between 20 and 5000 Hz), or other factors (*e.g.*, wind and waves, traffic noise along adjacent roadways, aquatic animals, currents, etc.) as described above. No direct data on ambient noise levels within Tillamook Bay are available; however, in-water ambient noise levels are considered comparable to similar bays.

The sum of the various natural and anthropogenic sound sources at any given location and time—which comprise "ambient" or "background" sound—depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10-20 dB from day to day (Richardson *et al.*, 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

In-water construction activities associated with the project may include impact pile driving, and vibratory pile driving and removal. The sounds produced by these activities fall into one of two general sound types: impulsive and non-impulsive. Impulsive sounds (*e.g.,* explosions, gunshots, sonic booms, impact pile driving) are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI, 1986; NIOSH, 1998; NMFS, 2018). Non-impulsive sounds (*e.g.* aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems) can be broadband, narrowband or tonal, brief or prolonged (continuous or intermittent), and typically do not have the high peak sound pressure with rapid rise/decay time that impulsive sounds do (ANSI, 1995; NIOSH, 1998; NMFS, 2018). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.*, Ward 1997 in Southall *et al.* 2007).

Two types of hammers would be used on this project: impact and vibratory. Impact hammers operate by repeatedly dropping and/or pushing a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is characterized by rapid rise times and high peak levels, a potentially injurious combination

(Hastings and Popper, 2005). Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce significantly less sound than impact hammers. Peak SPLs may be 180 dB or greater, but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman *et al.,* 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards, 2002; Carlson *et al.,* 2005).

The likely or possible impacts of the Corps' proposed activities on marine mammals could involve both non-acoustic and acoustic stressors. Potential non-acoustic stressors could result from the physical presence of the equipment and personnel; however, given there are no known pinniped haul-out sites in the vicinity of the proposed site of the MOF construction/deconstruction, visual and other non-acoustic stressors would be limited, and any impacts to marine mammals are expected to primarily be acoustic in nature. Acoustic stressors include effects of heavy equipment operation during pile installation and removal.

Acoustic Impacts

The introduction of anthropogenic noise into the aquatic environment from pile driving and removal is the primary means by which marine mammals may be harassed from the Corps' specified activities. In general, animals exposed to natural or anthropogenic sound may experience physical and psychological effects, ranging in magnitude from none to severe (Southall *et al.,* 2007, 2019). In general, exposure to pile driving noise has the potential to result in auditory threshold shifts and behavioral reactions (*e.g.*, avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior). Exposure to anthropogenic noise can also lead to non-observable physiological responses such an increase in stress hormones. Additional noise in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions such as communication and predator and prey detection. The effects of pile driving noise on marine mammals are dependent on several factors, including, but not limited to, sound type (*e.g.,* impulsive vs. non-impulsive), the species, age and sex class (*e.g.,* adult male vs. mom with calf), duration of exposure, the distance between the pile and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok *et al.,* 2004; Southall *et al.,* 2007). Here we discuss physical auditory effects (threshold shifts) followed by behavioral effects and potential impacts on habitat.

NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). The amount of threshold shift is customarily expressed in dB. A TS can be permanent or temporary. As described in NMFS (2018), there are numerous factors to consider when examining the consequence of TS, including, but not limited to, the signal temporal pattern (*e.g.,* impulsive or non-impulsive), likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, the magnitude of the TS, time to recovery (seconds to minutes or hours to days), the frequency range of the exposure (*i.e.,* spectral content), the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (*i.e.,* how animal uses sound within the frequency band of the signal; *e.g.,* Kastelein *et al.,* 2014), and the overlap between the animal and the source (*e.g.,* spatial, temporal, and spectral). When analyzing the auditory effects of noise exposure, it is often helpful to broadly categorize sound as either impulsive or non-impulsive. When considering auditory effects, vibratory pile driving is considered a non-impulsive source while impact pile driving is treated as an impulsive source.

Permanent Threshold Shift (PTS)—NMFS defines PTS as a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). Available data from humans and other terrestrial mammals indicate that a 40 dB threshold shift approximates PTS onset (see Ward *et al.,* 1958, 1959; Ward, 1960; Kryter *et al.,* 1966; Miller, 1974; Ahroon *et al.,* 1996; Henderson *et al.,* 2008). PTS levels for marine mammals are estimates, as with the exception of a single study unintentionally inducing PTS in a harbor seal (Kastak *et al.,* 2008), there are no empirical data measuring PTS in marine mammals largely due to the fact that, for various ethical reasons, experiments involving anthropogenic noise exposure at levels inducing PTS are not typically pursued or authorized (NMFS, 2018).

Temporary Threshold Shift (TTS)—A temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). Based on data from cetacean TTS measurements (see Southall *et al.* 2007), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Schlundt *et al.,* 2000; Finneran *et al.,* 2000, 2002). As described in Finneran (2015), marine mammal studies have shown the amount of TTS increases with SELcum in an accelerating fashion: at low exposures with lower SELcum, the amount of TTS is typically small and the growth curves have shallow slopes. At exposures with higher SELcum, the growth curves become steeper and approach linear relationships with the noise SEL.

Depending on the degree (elevation of threshold in dB), duration (*i.e.,* recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that takes place during a time when the animal is traveling through the open ocean, where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. We note that reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.,* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Relationships between TTS and PTS thresholds have not been studied in marine mammals, and there is no PTS data for cetaceans, but such relationships are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several decibels above (a 40-dB threshold shift approximates PTS onset; *e.g.*, Kryter *et al*., 1966; Miller, 1974) that inducing mild TTS (a 6-dB threshold shift approximates TTS onset; *e.g.*, Southall *et al*., 2007). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulse sounds (such as impact pile driving pulses as received close to the source) are at least 6 dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level thresholds are 15 to 20 dB higher than TTS cumulative sound exposure level thresholds (Southall *et al*., 2007). Given the higher level of sound or longer exposure duration necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur.

TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter, 1985). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends. Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin), beluga whale (*Delphinapterus* *leucas*), harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis*)) and five species of pinnipeds exposed to a limited number of sound sources (*i.e.,* mostly tones and octave-band noise) in laboratory settings (Finneran, 2015). TTS was not observed in trained spotted (*Phoca largha*) and ringed (*Pusa hispida*) seals exposed to impulsive noise at levels matching previous predictions of TTS onset (Reichmuth *et al.,* 2016). In general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran, 2015). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. No data are available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al.* (2007), Finneran and Jenkins (2012), Finneran (2015), and Table 5 in NMFS (2018).

Construction and deconstruction of the MOF, which is required to repair the Tillamook South Jetty, requires a combination of impact pile driving and vibratory pile driving. During this project, these activities will not occur at the same time and there will be pauses in activities producing the sound during each day. Given these pauses and that many marine mammals are likely moving through the project area and not remaining for extended periods of time, the potential for TTS declines.

Behavioral Harassment—Exposure to noise from pile driving and removal also has the potential to behaviorally disturb marine mammals. Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.*, minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Disturbance may result in changing durations of surfacing and dives, changing direction and/or speed; reducing/increasing vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); eliciting a visible startle response or aggressive behavior (such as tail/fin slapping or jaw clapping); avoidance of areas where sound sources are located. Pinnipeds may increase their haul out time, possibly to avoid in-water disturbance (Thorson and Reyff, 2006). Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.,* species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.,* Richardson *et al.,* 1995; Wartzok *et al.,* 2003; Southall *et al.,* 2007; Weilgart, 2007; Archer *et al.,* 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.,* 2012), and can vary depending on characteristics associated with the sound source (*e.g.,* whether it is moving or stationary, number of sources, distance from the source). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Please see Appendices B and C of Southall *et al.* (2007) and Gomez *et al.* (2016) for reviews of studies involving marine mammal behavioral responses to sound.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.*, 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a "progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial," rather than as, more generally, moderation in response to human disturbance (Bejder *et al.*, 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure.

As noted above, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al*., 1995; NRC, 2003; Wartzok *et al*., 2003). Controlled experiments with captive marine mammals have showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al*., 1997; Finneran *et al*., 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds, 2002; see also Richardson *et al*., 1995; Nowacek *et al*., 2007).

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g*., Lusseau and Bejder, 2007; Weilgart, 2007; NRC, 2005). However, there are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

Changes in dive behavior can vary widely and may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive (*e.g*., Frankel and Clark, 2000; Costa *et al*., 2003; Ng and Leung, 2003; Nowacek *et al*., 2004; Goldbogen *et al*., 2013a,b). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g*., foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (*e.g.,* bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.,* Croll *et al.,* 2001; Nowacek *et al.,* 2004; Madsen *et al.,* 2006; Yazvenko *et al.,* 2007). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Variations in respiration naturally vary with different behaviors and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (*e.g*., Kastelein *et al*., 2001, 2005, 2006; Gailey *et al*., 2007).

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al.,* 2000; Fristrup *et al.,* 2003; Foote *et al.,* 2004), while right whales (*Eubalaena glacialis*) have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.,* 2007). In some cases, animals may cease sound production during production of aversive signals (Bowles *et al.,* 1994).

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al.,* 1995). For example, gray whales are known to change direction – deflecting from customary migratory paths – in order to avoid noise from seismic surveys (Malme *et al.,* 1984). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g.*, Bowles *et al.,* 1994; Goold, 1996; Stone *et al.,* 2000; Morton and Symonds, 2002; Gailey *et al.,* 2007). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g.*, Blackwell *et al.,* 2004; Bejder *et al.,* 2006; Teilmann *et al.,* 2006).

A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in the intensity of the response (*e.g.*, directed movement, rate of travel). Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus, 1996, Bowers *et al.*, 2018).

The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (Evans and England, 2001). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves, 2008), and whether individuals are solitary or in groups may influence the response.

Behavioral disturbance can also impact marine mammals in more subtle ways. Increased vigilance may result in costs related to diversion of focus and attention (*i.e.*, when a response consists of increased vigilance, it may come at the cost of decreased attention to other critical behaviors such as foraging or resting). These effects have generally not been demonstrated for marine mammals, but studies involving fish and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates (*e.g.*, Beauchamp and Livoreil, 1997; Fritz *et al.,* 2002; Purser and Radford, 2011). In addition, chronic disturbance can cause population declines through reduction of fitness (*e.g.*, decline in body condition) and subsequent reduction in reproductive success, survival, or both (*e.g.*, Harrington and Veitch, 1992; Daan *et al.,* 1996; Bradshaw *et al.,* 1998). However, Ridgway *et al.* (2006) reported that increased vigilance in bottlenose dolphins exposed to sound over a five-day period did not cause any sleep deprivation or stress effects.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.,* 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.,* 2007). Note that there is a difference between multi-day substantive behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

Stress responses —An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.*, Seyle, 1950; Moberg, 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.*, Moberg, 1987; Blecha, 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al.,* 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.*, Holberton *et al.,* 1996; Hood *et al.,* 1998; Jessop *et al.,* 2003; Krausman *et al.,* 2004; Lankford *et al.,* 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker, 2000; Romano *et al.,* 2002b) and, more rarely, studied in wild populations (*e.g.*, Romano *et al.,* 2002a). For example, Rolland *et al.* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003), however distress is an unlikely result of this project based on observations of marine mammals during previous, similar construction projects.

Auditory Masking— Since many marine mammals rely on sound to find prey, moderate social interactions, and facilitate mating (Tyack, 2008), noise from anthropogenic sound sources can interfere with these functions, but only if the noise spectrum overlaps with the hearing sensitivity of the marine mammal (Southall *et al.,* 2007; Clark *et al.,* 2009; Hatch *et al.,* 2012). Chronic exposure to excessive, though not high-intensity, noise could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions (Clark *et al.,* 2009). Acoustic masking is when other noises such as from human sources interfere with an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.*, those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al*., 1995; Erbe *et al*., 2016). Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance fitness in survival and reproduction. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.,* signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g*., sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is man-made, it may be considered harassment when disrupting or altering critical behaviors. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.*, Clark *et al*., 2009) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.*, Miller *et* *al*., 2000; Foote *et al*., 2004; Parks *et al*., 2007; Di Iorio and Clark, 2009; Holt *et al*., 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al*., 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore, 2014). Masking can be tested directly in captive species (*e.g.*, Erbe, 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.*, Branstetter *et al*., 2013).

Marine mammals in Tillamook Bay are exposed to anthropogenic noise which may lead to some habituation, but is also a source of masking. Vocalization changes may result from a need to compete with an increase in background noise and include increasing the source level, modifying the frequency, increasing the call repetition rate of vocalizations, or ceasing to vocalize in the presence of increased noise (Hotchkin and Parks, 2013).

Masking is more likely to occur in the presence of broadband, relatively continuous noise sources. Energy distribution of pile driving covers a broad frequency spectrum, and sound from pile driving would be within the audible range of pinnipeds and cetaceans present in the proposed action area. While some pile driving during the Corps' activities may mask some acoustic signals that are relevant to the daily behavior of marine mammals, the short-term duration and limited areas affected make it very unlikely that survival would be affected.

Airborne Acoustic Effects—Pinnipeds that occur near the project site could be exposed to airborne sounds associated with pile driving and removal that have the potential to cause behavioral harassment, depending on their distance from these activities. Airborne noise would primarily be an issue for pinnipeds that are swimming or hauled out near the project site within the range of noise levels elevated above the acoustic criteria. However, given that the closest known haul outs are approximately 1.5 km (0.9 mi) away for harbor seals and approximately 23 km (14 mi) or greater for California sea lions, Steller sea lions, and northern elephant seals, the likelihood of pinnipeds being exposed to airborne noise over the short duration of intermittent pile driving and removal is low.

We recognize that pinnipeds in the water could be exposed to airborne sound that may result in behavioral harassment when looking with their heads above water. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. For instance, anthropogenic sound could cause hauled-out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon the area and move further from the source. However, these animals would previously have been `taken' because of exposure to underwater sound above the behavioral harassment thresholds, which are in all cases larger than those associated with airborne sound. Thus, the behavioral harassment of these animals is already accounted for in these estimates of potential take. Therefore, we do not believe that authorization of incidental take resulting from airborne sound for pinnipeds is warranted, and airborne sound is not discussed further here.

Marine Mammal Habitat Effects

The Corps' proposed activities would not result in permanent negative impacts to habitats used directly by marine mammals, but may have potential short-term impacts to food sources such as forage fish and may affect acoustic habitat (see masking discussion above). There are no known foraging hotspots or other ocean bottom structure of significant biological importance to marine mammals present in the marine waters of the project area. The Corps' proposed activities in Tillamook Bay could have localized, temporary impacts on marine mammal habitat and their prey by increasing in-water sound pressure levels and slightly decreasing water quality. During impact pile driving and vibratory pile driving or removal, elevated levels of underwater noise would ensonify a portion of Tillamook Bay where both fishes and mammals occur and could affect foraging success. Additionally, marine mammals may avoid the area during construction, however, displacement due to noise is expected to be temporary and is not expected to result in long-term effects to the individuals or populations. The proposed construction activities are of short duration and would likely have temporary impacts on marine mammal habitat through increases in underwater and airborne sound.

Pile installation/removal may temporarily increase turbidity resulting from suspended sediments. Any increases would be temporary, localized, and minimal. In general, turbidity associated with pile installation is localized to about a 7.6 m (25 ft) radius around the pile (Everitt *et al.,* 1980). Cetaceans and pinnipeds in Tillamook Bay are not expected to be close enough to the project pile driving areas to experience effects of turbidity; however, if they were they could avoid localized areas of turbidity. Therefore, the impact from increased turbidity levels is expected to minimal for marine mammals. Furthermore, pile driving and removal at the project site would not obstruct movements or migration of marine mammals.

Potential Pile Driving Effects on Prey —Sound from pile driving may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.*, crustaceans, cephalopods, fish, zooplankton). Marine mammal prey varies by species, season, and location. Here, we describe studies regarding the effects of noise on known marine mammal prey.

Fish utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.*, Zelick and Mann, 1999; Fay, 2009). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.,* 2008). The potential effects of noise on fishes depends on the overlapping frequency range, distance from the sound source, water depth of exposure, and species-specific hearing sensitivity, anatomy, and physiology. Key impacts to fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality.

Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to noise depends on the physiological state of the fish, past exposures, motivation (*e.g.*, feeding, spawning, migration), and other environmental factors. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish; several are based on studies in support of large, multiyear bridge construction projects (*e.g.,* Scholik and Yan, 2001, 2002; Popper and Hastings, 2009). Several studies have demonstrated that impulse sounds might affect the distribution and behavior of some fishes, potentially impacting foraging opportunities or increasing energetic costs (*e.g.*, Fewtrell and McCauley, 2012; Pearson *et al.,* 1992; Skalski *et al.,* 1992; Santulli *et al.,* 1999; Paxton *et al.,* 2017). However, some studies have shown no or slight reaction to impulse sounds (*e.g.*, Pena *et al.,* 2013; Wardle *et al.,* 2001; Jorgenson and Gyselman, 2009; Cott *et al.,* 2012). More commonly, though, the impacts of noise on fish are temporary.

SPLs of sufficient strength have been known to cause injury to fish and fish mortality (summarized in Popper *et al*., 2014). However, in most fish species, hair cells in the ear continuously regenerate and loss of auditory function likely is restored when damaged cells are replaced with new cells. Halvorsen *et al.* (2012a) showed that a TTS of 4-6 dB was recoverable within 24 hours for one species. Impacts would be most severe when the individual fish is close to the source and when the duration of exposure is long.

Injury caused by barotrauma can range from slight to severe and can cause death, and is most likely for fish with swim bladders. Barotrauma injuries have been documented during controlled exposure to impact pile driving (Halvorsen *et al.,* 2012b; Casper *et al.,* 2013).

The most likely impact to fish from pile driving and removal activities at the project area would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary due to the short timeframe of the project.

In summary, given the short daily duration of sound associated with individual pile driving and the small area being affected relative to available nearby habitat, pile driving activities associated with the proposed action are not likely to have a permanent, adverse effect on any fish habitat, or populations of fish species or other prey. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. Thus, we conclude that impacts of the specified activity are not likely to have more than short-term adverse effects on any prey habitat or populations of prey species. Further, any impacts to marine mammal habitat are not expected to result in significant or long-term consequences for individual marine mammals, or to contribute to adverse impacts on their populations.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through these IHAs, which will inform both NMFS' consideration of "small numbers" and the negligible impact determinations.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would primarily be by Level B harassment, as use of the acoustic sources (*i.e.*, pile driving and removal) has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some potential for auditory injury (Level A harassment) to result, primarily for high frequency cetaceans and/or phocids because predicted auditory injury zones are larger than for otariids. Auditory injury is unlikely to occur for otariids. The proposed mitigation and monitoring measures are expected to minimize the severity of the taking to the extent practicable.

As described previously, no serious injury or mortality is anticipated or proposed to be authorized for this activity. Below we describe how the proposed take numbers are estimated.

For acoustic impacts, generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) the number of days of activities. We note that while these factors can contribute to a basic calculation to provide an initial prediction of potential takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.,* previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the proposed take estimates.

Acoustic Thresholds

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source or exposure context (*e.g.*, frequency, predictability, duty cycle, duration of the exposure, signal-to-noise ratio, distance to the source), the environment (*e.g.*, bathymetry, other noises in the area, predators in the area), and the receiving animals (hearing, motivation, experience, demography, life stage, depth) and can be difficult to predict (*e.g.*, Southall *et al.,* 2007, 2021, Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a metric that is both predictable and measurable for most activities, NMFS typically uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS generally predicts that marine mammals are likely to be behaviorally harassed in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above root-mean-squared pressure received levels (RMS SPL) of 120 dB (referenced to 1 micropascal (re 1 μPa)) for continuous (*e.g.,* vibratory pile-driving, drilling) and above RMS SPL 160 dB re 1 μPa for non-explosive impulsive (*e.g.*, seismic airguns) or intermittent (*e.g.*, scientific sonar) sources.

The Corps' proposed activity includes the use of continuous (vibratory pile driving/removal) and impulsive (impact pile driving) sources, and therefore the RMS SPL thresholds of 120 and 160 dB re 1 μPa are applicable.

Level A harassment – NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). The Corps' proposed activity includes the use of impulsive (impact pile driving) and non-impulsive (vibratory pile driving/removal) sources.

These thresholds are provided in the table below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS' 2018 Technical Guidance, which may be accessed at: *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance*.

Table 4. Thresholds Identifying the Onset of Permanent Threshold Shift.

	PTS Onset Thresholds* (Received Level)	
Hearing Group	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{p,\text{0-pk,flat}}$: 219 dB $L_{\text{E},p,\text{ LF,24h}}$: 1183 dB	*Cell 2* $L_{\text{E},p,\text{ LF,24h}}$: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{p,\text{0-pk,flat}}$: 230 dB $L_{\text{E},p,\text{ MF,24h}}$: 1185 dB	*Cell 4* $L_{\text{E},p,\text{ MF,24h}}$: 198 dB
High-Frequency (HF) Cetaceans	*Cell 5* $L_{p,\text{0-pk,flat}}$: 202 dB $L_{\text{E},p,\text{HF,24h}}$: 155 dB	*Cell 6* $L_{\text{E},p,\text{ HF,24h}}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{p,\text{0-pk.flat}}$: 218 dB $L_{\text{E},p,\text{PW,24h}}$: 1185 dB	*Cell 8* $L_{\text{E},p,\text{PW,24h}}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{p,\text{0-pk,flat}}$: 232 dB $L_{\text{E},p,\text{OW,24h}}$: 203 dB	*Cell 10* $L_{\text{E},p,\text{OW,24h}}$: 219 dB

* Dual metric thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds are recommended for consideration.

Note: Peak sound pressure level ($L_{p,\text{0-pk}}$) has a reference value of 1 µPa, and weighted cumulative sound exposure level ($L_{\text{E},p}$) has a reference value of 1µPa^{2}s. In this Table, thresholds are abbreviated to be more reflective of International Organization for Standardization standards (ISO 2017). The subscript "flat" is being included to indicate peak sound pressure are flat weighted or unweighted within the generalized hearing range of marine mammals (*i.e.*, 7 Hz to 160 kHz). The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The weighted cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these thresholds will be exceeded.

Ensonified Area

Here, we describe operational and environmental parameters of the activity that are used in estimating the area ensonified above the acoustic thresholds, including source levels and transmission loss coefficient.

The sound field in the project area is the existing background noise plus additional construction noise from the proposed project. Marine mammals are expected to be affected via sound generated by the primary components of the project (*i.e.*, impact pile driving, vibratory pile driving, and vibratory pile removal).

Sound Source Levels of Proposed Activities – The intensity of pile driving sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. In order to calculate distances to the Level A harassment and Level B harassment sound thresholds for the methods and piles being used in this project, NMFS used empirical data from sound source verification (SSV) studies reported in Navy (2015) and CALTRANS (2020), to develop source levels for the various pile types, sizes and methods (Table 5). These proxies were chosen as they were obtained from SSV studies on piles of comparable types and sizes and/or in comparable environments (*e.g.,* they had comparable water depths). Note that these source levels represents the SPL referenced at a distance of 10 m from the source. It is conservatively assumed that the Corps will use steel instead of timber for the 24-inch pipe piles as the estimated proxy values for steel are louder than timber (*e.g.,* Greenbusch Group, 2018; 84 FR 61026, November 12, 2019). It is also conservatively assumed that vibratory removal will produce comparable levels of in-water noise as vibratory installation.

Table 5. Estimates of Underwater Sound Levels Generated During Vibratory and Impact Pile Installation, and Vibratory Pile Removal

Pile Driving Method	Pile Description	Source Level (dB Peak)	Source Level (dB RMS)	Source Level (dB SEL)	Reference
Impact (attenuated[1])	24-inch steel pipe pile	198	184	173	CALTRANS (2020)
Vibratory (installation and removal; unattenuated)	24-inch steel pipe pile	177	161	-	Navy (2015)
	24-inch AZ steel sheets	-	163	163	CALTRANS (2020)
	12-inch steel H-piles	165	150	147	CALTRANS (2020)

[1]The estimated SPLs for 24-inch steel pipes assume a 5 dB reduction resulting from the use of a confined bubble curtain system.

Level B Harassment Zones – Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

TL = B * log10 (R1/R2),

Where:

B = transmission loss coefficient (assumed to be 15)

R1 = the distance of the modeled SPL from the driven pile, and

R2 = the distance from the driven pile of the initial measurement.

This formula neglects loss due to scattering and absorption, which is assumed to be zero here. The degree to which underwater sound propagates away from a sound source is dependent on a variety of factors, most notably the water bathymetry and presence or absence of reflective or absorptive conditions including in-water structures and sediments. The recommended TL coefficient for most nearshore environments is the practical spreading value of 15. This value results in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions, which is the most appropriate assumption for the Corps' proposed construction activities in the absence of specific modelling. All Level B harassment isopleths are reported in Table 7 considering RMS SSLs for impact and vibratory pile driving, respectively.

Level A Harassment Zones –The ensonified area associated with Level A harassment is more technically challenging to predict due to the need to account for a duration component. Therefore, NMFS developed an optional User Spreadsheet tool to accompany the Technical Guidance that can be used to relatively simply predict an isopleth distance for use in conjunction with marine mammal density or occurrence to help predict potential takes. We note that because of some of the assumptions included in the methods underlying this optional tool, we anticipate that the resulting isopleth estimates are typically going to be overestimates of some degree, which may result in an overestimate of potential take by Level A harassment. However, this optional tool offers the best way to estimate isopleth distances when more sophisticated modeling methods are not available or practical. For stationary sources, such as vibratory and impact pile driving, the optional User Spreadsheet tool predicts the distance at which, if a marine mammal remained at that distance for the duration of the activity, it would be expected to incur PTS. Inputs used in the optional User Spreadsheet tool, and the resulting estimated isopleths, are reported in Table 6.

Table 6. NMFS User Spreadsheet Inputs

	Impact Pile Driving	Vibratory Pile Driving					
	Installation	Installation			Removal		
	24-inch steel pipe pile	24-inch steel pipe pile	24-inch AZ steel sheets	12-inch steel H-piles	24-inch steel pipe pile	24-inch AZ steel sheets	12-inch steel H-piles
Spreadsheet Tab Used	E.1) Impact pile driving	A.1) Non-Impul, Stat, Cont.	A.1) Non-Impul, Stat, Cont.	A.1) Non-Impul, Stat, Cont.	A.1) Non-Impul, Stat, Cont.	A.1) Non-Impul, Stat, Cont.	A.1) Non-Impul, Stat, Cont.
Source Level (SPL)	173 dB SEL	161 dB RMS	163 dB RMS	150 dB RMS	161 dB RMS	163 dB RMS	150 dB RMS
Transmission Loss Coefficient	15	15	15	15	15	15	15
Weighting Factor Adjustment (kHz)	2	2.5	2.5	2.5	2.5	2.5	2.5
Number of strikes per pile	533	--	--	--	--	--	--
Time to install / remove single pile (minutes)	--	15	10	10	5	3	3
Piles per day	4	8	25	10	12	50	10

Table 7. Distances to Level A harassment, by hearing group, and Level B harassment thresholds per pile type and pile driving method

Activity	Pile Description	Piles per day	Level A harassment distance (m)			Level A harassment areas (km²) for all hearing groups	Level B harassment distance (m) all hearing groups[1]	Level B harassment areas (km²) for all hearing groups[1]
			HF	PW	OW			
Impact Installation (attenuated)[2]	24-inch steel pipe pile	4	424.5	190.7	13.8	< 0.5	399	0.39
Vibratory Installation	24-inch steel pipe pile	8	16.0	6.6	0.5	< 0.1	5,412	20.14
	24-inch AZ steel sheets	14	35.5	14.6	1.0	< 0.1	7,357	27.01
	12-inch steel H-piles	10	2.6	1.1	0.1	< 0.1	1,000	1.84
Vibratory Removal	24-inch steel pipe pile	12	10.1	4.2	0.3	< 0.1	5,412	20.14
	24-inch AZ steel sheets	50	25.3	10.4	0.7	< 0.1	7,357	27.01
	12-inch steel H-piles	10	1.2	0.5	0.0	< 0.1	1,000	1.84

[1]Harassment areas have been truncated where appropriate to account for land masses
[2]Distances to Level A harassment, by hearing group, for impact pile driving were calculated based on SEL source levels as they resulted in larger, thus more conservative, isopleths for calculating PTS onset than Peak source levels

Marine Mammal Occurrence and Take Estimation

In this section we provide information about the occurrence of marine mammals, including density or other relevant information, that will inform the take calculations. We also describe how the information provided above is synthesized to produce a quantitative estimate of the take that is reasonably likely to occur and proposed for authorization.

In most cases, recent marine mammal counts, density estimates, or abundance estimates were not available for Tillamook Bay. Thus, information regarding marine mammal occurrence from proximal data obtained from nearshore sightings and haul-out sites (*e.g.,* Three Arch Rock) is used to approximate local abundance in Tillamook Bay. When proximal count estimates were available (*i.e.*, for harbor seals, Steller sea lions, and California sea lions), the Corps derived density estimates with an assumption that surveys accounted for animals present in the entirety of Tillamook Bay, an area roughly 37 km^2 (Oregon Coastal Atlas, 2022). The Corps multiplied marine mammal densities by isopleth areas to estimate potential take associated with pile driving. Given that marine mammal densities are likely not uniform in Tillamook Bay, NMFS instead estimates potential take associated with pile driving for these and the other marine mammal species assuming maximum daily occurrence rates (based on the abovementioned nearby proximal count estimates) multiplied by the total number of action days estimated per activity. There may be 20 (vibratory pile driving only) to 23 (vibratory and impact pile driving) total days of noise exposure from pile driving during the Corps' proposed activities in Year 1 and 13 (vibratory removal only) total days of noise exposure from pile driving during the Corps' proposed activities in Year 2. Takes for Year one for all species except harbor porpoises (see below) are estimated assuming that both vibratory and impact pile driving will be necessary and thus the maximum number of days of action days are required (*i.e.,* 23 days). Takes for Year two assume that 13 total action days are required. A summary of take proposed for authorization is available in Tables 8 and 9.

Harbor Porpoises

There were multiple occurrences of 1-2 harbor porpoises detected in the coastal waters just north of the Tillamook Bay entrance during June and July of 1990 (Halpin *et al.,* 2009; Ford *et al*., 2013). More recently, aerial surveys have detected single animals near the Tillamook Bay entrance in October 2011 and September 2012 (Adams *et al*., 2014). Although there were no recorded harbor porpoise observations within Tillamook Bay itself, the species is somewhat cryptic and there is potentially low detection during aerial surveys. Thus, NMFS estimates the daily harbor porpoise abundance within Tillamook Bay to be 1 individual.

During Year 1, if impact pile driving is necessary for driving steel piles, the Level A harassment distance for this activity for harbor porpoises is larger than the Level B harassment distance (Table 7) and the proposed shutdown zone (see the **Proposed Mitigation** section). Therefore, the Corps proposed that all harbor porpoises in Tillamook Bay on days when impact pile driving occurs would be taken by Level A harassment. NMFS concurs with this estimate and proposes to authorize 9 instances of take by Level A harassment for harbor porpoises in Year 1 during construction of the MOF (1 harbor porpoise per day X 9 days of impact pile driving = 9 takes by Level A harassment).

During Year 1, if vibratory and impact pile driving is required, the Corps estimated that there could be 14 takes of harbor porpoises by Level B harassment (1 harbor porpoise per day X 12 days vibratory installing steel sheets = 12 takes by Level B harassment, and 1 harbor porpoise per day X 2 days vibratory installing H piles = 2 takes by Level B harassment, for a total of 14 takes by Level B harassment; Table 1). If only vibratory pile driving is required, the Corps estimated that 20 harbor porpoises may be taken by Level B harassment (1 harbor porpoise per day X 20 total action days; Table 1). Therefore, to be conservative, NMFS proposes to authorize 20 instances of take by Level B harassment for harbor porpoises (the maximum estimate of animals that may be taken by Level B harassment based on the two likely scenarios) in Year 1 during construction of the MOF.

During Year 2, the Corps requested and NMFS proposes to authorize 13 instances of take by Level B harassment for harbor porpoises during vibratory removal of the MOF (1 harbor porpoise per day X 13 total action days; Table 1). No Level A harassment is anticipated to occur or proposed to be authorized. Considering the small Level A harassment zones (Table 7) in comparison to the required shutdown zones (see the **Proposed Mitigation** section) it is unlikely that a harbor porpoise will enter and remain within the area between the Level A harassment zone and the shutdown zone for a duration long enough to be taken by Level A harassment.

California Sea Lions

The estimate for daily California sea lion abundance (n = 11) is based on coastal surveys conducted between 2002 and 2005 (Scordino, 2006). While pile driving will occur in winter or summer, the maximum number of animals detected during any month (*i.e.*, 11 sea lions in April) at the Three Arch Rock haul out site, located approximately 23 km (14 mi) from the proposed site of the MOF, was used to estimate daily occurrence by the Corps. Given the distance of this haul out site from the proposed activities, the fact that pile driving is not expected to occur in April due to timing constrictions, and the low likelihood that all animals present at the Three Arch Rock would leave and enter Tillamook Bay on a single day; the Corps' estimated that approximately half of the individuals present at Three Arch Rock (6 California sea lions) could potentially enter Tillamook Bay during pile driving and be subject to acoustic harassment. NMFS concurs and estimates, based on the best available science, the daily California sea lion abundance within Tillamook Bay to be 6 individuals.

During Year 1, NMFS proposes to authorize 138 instances of take by Level B harassment for California sea lions during the construction of the MOF (6 California sea lions per day X 23 total action days required for impact and vibratory pile driving; Table 1). During Year 2, NMFS proposes to authorize 78 instances of take by Level B harassment for California sea lions during vibratory removal of the MOF (6 California sea lions per day X 13 total action days; Table 1). Under either scenario, Level A harassment is not anticipated or proposed to be authorized for Year 1 or Year 2. Considering the small Level A harassment zones (Table 1) in comparison to the required shutdown zones (see the **Proposed Mitigation** section) it is unlikely that a California sea lion will enter and remain within the area between the Level A harassment zone and the shutdown zone for a duration long enough to be taken by Level A harassment.

Steller Sea Lions

The Corps and NMFS are unaware of any recent data regarding Steller sea lion abundance near Tillamook Bay. Therefore, seasonal Steller sea lion abundance was estimated based on the maximum number of animals detected (n = 38 for between November and February, and n = 58 between July and August) at the Three Arch Rock haul out site during coastal surveys between 2002 and 2005 (Scordino, 2006). Given that this haul out site is roughly 23 km (14 mi) away from the proposed MOF, the Corps conservatively estimated that half of the individuals present at Three Arch Rock (19 Steller sea lions between November and February, and 29 Steller sea lions between July and August) could potentially disperse throughout Tillamook Bay during pile driving and be subject to harassment from the proposed activities. For the purposes of our take estimation, NMFS conservatively assumes that the daily Steller sea lion abundance in Tillamook Bay is equivalent to the largest seasonal abundance that the Corps estimated would be present (*i.e.*, we assume that 29 individual Steller sea lions would be present each day in Tillamook Bay).

During Year 1, NMFS proposes to authorize 667 instances of take by Level B harassment for Steller sea lions during the construction of the MOF (29 Steller sea lions per day X 23 total action days required for impact and vibratory pile driving; Table 1). During Year 2, NMFS proposes to authorize 377 instances of take by Level B harassment for Steller sea lions during vibratory removal of the MOF (6 Steller sea lions per day X 13 total action days; Table 1). Under either scenario, Level A harassment is not anticipated or proposed to be authorized for Year 1 or Year 2. The Level A harassment zones (Table 1) are smaller than the required shutdown zones (see the **Proposed Mitigation** section), therefore it is unlikely that a Steller sea lion will enter and remain within the area between the Level A harassment zone and the shutdown zone for a duration long enough to be taken by Level A harassment.

Harbor Seals

The latest (May 2014) pinniped aerial surveys conducted by the Oregon Department of Fish and Wildlife (ODFW, 2022) estimated 220 harbor seals (pups and non-pups combined) within Tillamook Bay (B.E. Wright, personal communication, February 12, 2021). After applying the Huber *et al*. (2001) correction factor of 1.53, used to account for likely imperfect detection during surveys, the adjusted number of harbor seals that may have been present Tillamook Bay during the 2014 surveys is approximately 337 individuals. However, that estimate likely overestimates the number of harbor seals present in the non-pupping season. Therefore, the Corps used calculations from monthly surveys of Tillamook Bay haul out sites between 1978 and 1981 carried out by Brown and Mate (1983) to estimate the average proportion of animals present during the Nov – Feb and Jul – Aug proposed construction windows (relative to counts observed in May). Accounting for these proportions (0.67 and 1.2, respectively), the

Corps estimated that the 337 harbor seals likely present in May 2014 would have equated to an average abundance of 226 harbor seals between November and February and 404 harbor seals between July and August. For the purposes of our take estimation, NMFS conservatively assumes that the daily harbor seal abundance in Tillamook Bay is equivalent to the largest seasonal abundance that the Corps estimated would be present (*i.e.*, we assume that 404 individual harbor seals would be present each day in Tillamook Bay).

During Year 1, NMFS estimates that 9,292 total instances of take for harbor seals would occur during the construction of the MOF (404 harbor seals per day X 23 total action days required for impact and vibratory pile driving; Table 1). NMFS estimates that 3,636 of these instances of take would be attributed to impact pile driving (404 harbor seals per day X 9 days impact pile driving) and the remaining 5,656 instances of take would be attributed to vibratory pile driving (404 harbor seals per day X 14 days vibratory pile driving). During impact pile driving, while a 100 m shutdown zone would be implemented for harbor seals (see Table 10 in the **Proposed Mitigation** section), an area of approximately 0.07 km^2 would still be ensonified above the Level A harassment threshold for phocids (Table 7). Given this remaining Level A harassment area for phocids is 17.95 percent of the Level B harassment area (0.39 km^2), NMFS proposes to authorize 653 (17.95 percent) of the total instances of take attributed to impact pile driving (*i.e.*, 17.95 percent of 3,636 instances of take), as instances of take by Level A harassment. NMFS proposes to authorize the remaining 8,639 instances of take by Level B harassment.

During Year 2, NMFS proposes to authorize 5,252 instances of take by Level B harassment for harbor seals during vibratory removal of the MOF (404 harbor seals per day X 13 total action days; Table 1). No take by Level A harassment is anticipated to occur or proposed to be authorized. The Level A harassment zones (Table 1) are smaller than the required shutdown zones (see the **Proposed Mitigation** section), therefore it is unlikely that a harbor seal will enter and remain within the area between the Level A harassment zone and the shutdown zone for a duration long enough to be taken by Level A harassment during MOF deconstruction.

Northern Elephant Seal

There were no recorded sightings of elephant seals within 16 km (10 mi) of Tillamook Bay within the OBIS-SEAMAP database (Halpin *et al.,* 2009; OBIS-SEAMAP, 2022) nor were any animals detected at the closest haul out site (*i.e.*, Three Arch Rock) during pinniped surveys between 2002 and 2005 (Scordino, 2006). In fact, the closest haul out site with Northern elephant seal observations during surveys was Cape Arago (Scordino 2006), roughly 6 km (4 mi) south of Coos Bay and 256 km (159 mi) south of Tillamook Bay. Given the low likelihood of occurrence within the project vicinity and the lack of reported sightings within the bay (Halpin *et al.,* 2009; OBIS-SEAMAP, 2022), the Corps conservatively estimated, and NMFS assumes, elephant seal abundance within Tillamook Bay at 1 individual every other day.

During Year 1, the Corps estimated that 12 northern elephant seals may be taken during the construction of the MOF (1 elephant seal every other day X 23 total action days; Table 1). If impact pile driving is necessary for driving steel piles, the Corps estimated that the total take during the 9 days of impact pile driving would be 5 individuals (1 elephant seal every other day X 9 total action days; Table 1). While a 100 m shutdown zone would be implemented for northern elephant seals during impact pile driving (see Table 10 in the **Proposed Mitigation** section), an area of approximately 0.07 km^2 would still be ensonified above the Level A harassment threshold for phocids during this activity (Table 7). Given this remaining Level A harassment area for phocids (0.07 km^2) is 17.95 percent of the Level B harassment area (0.39 km^2), NMFS proposes to authorize 17.95 percent, or 1, instance of take by Level A harassment for northern elephant seals during impact pile driving (17.95 percent of the 12 total instances of take). We propose that the remaining 11 instances of take be by Level B harassment.

During Year 2, the Corps requested and we propose 7 instances of Level B harassment take for northern elephant seals during vibratory removal of the MOF (1 elephant seal every other day X 13 total action days; Table 1). Level A harassment is not anticipated or proposed to be authorized. The Level A harassment zones (Table 1) are smaller than the required shutdown zones (see the **Proposed Mitigation** section), therefore it is unlikely that a northern elephant seal will enter and remain within the area between the Level A harassment zone and the shutdown zone for a duration long enough to be taken by Level A harassment during deconstruction of the MOF.

Table 8. Proposed Authorized Amount of Taking in Year 1

Species	Stock	Level A	Level B	Total	Percent of Stock
Harbor porpoise	Northern OR/WA Coast	9	20	29	0.14
California sea lion	U.S.	0	138	138	0.05
Steller sea lion	Eastern	0	667	667	1.54
Harbor seal	OR/CA Coastal	653	8,639	9,292	37.57
Northern elephant seal	California Breeding	1	11	12	0.01

Table 9. Proposed Authorized Amount of Taking in Year 2

Species	Stock	Level A	Level B	Total	Percent of Stock
Harbor porpoise	Northern OR/WA Coast	0	13	13	0.06
California sea lion	U.S.	0	78	78	0.03
Steller sea lion	Eastern	0	337	337	0.78
Harbor seal	OR/CA Coastal	0	5,252	5,252	21.24
Northern elephant seal	California Breeding	0	7	7	<0.01

Proposed Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, NMFS considers two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability implemented as planned), and;

(2) The practicability of the measures for applicant implementation, which may consider such things as cost, and impact on operations.

The Corps must employ the following standard mitigation measures, as included in their application and the proposed IHAs:

- The Corps must conduct briefings between construction supervisors and crews and the marine mammal monitoring team prior to the start of all pile driving activity, and when new personnel join the work, to ensure that responsibilities, communication procedures, marine mammal monitoring protocols, and operational procedures are clearly understood;

- For in-water work other than pile driving/removal (*e.g.*, stone placement, use of barge-mounted excavators, or dredging), if a marine mammal comes within 10 m (33 ft), operations shall cease. Should a marine mammal come within 10 m (33ft) of a vessel in transit, the boat operator would reduce vessel speed to the minimum level required to maintain steerage and safe working conditions. If human safety is at risk, the in-water activity will be allowed to continue until it is safe to stop;
- In-water work activities may only occur when PSOs can effectively visually monitor for the presence of marine mammals, and when the entire shutdown zone and adjacent waters are visible (*e.g.*, including during daylight hours and when monitoring effectiveness is not reduced due to rain, fog, snow, etc.).
- For all pile driving/removal activities, the Corps must establish a minimum 15 m (49 ft) shutdown zone. The purpose of a shutdown zone is generally to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). Shutdown zones will vary based on the type of driving/removal activity type and by marine mammal hearing group (see Table 10). Here, shutdown zones are larger than the calculated Level A harassment isopleth shown in Table 7, except for harbor porpoises, harbor seals, and northern elephant seals during impact driving of 24-inch steel piles when a 100-m shutdown zone will be visually monitored;

Table 10. Shutdown Zones During Project Activities

Activity	Pile Description	Distance (m)		
		HF	PW	OW
Impact Installation (attenuated)	24-inch steel pipe pile	100	100	15
Vibratory Installation	24-inch steel pipe pile	50	15	15
	24-inch AZ steel sheets	50	15	15
	12-inch steel H-piles	15	15	15
Vibratory Removal	24-inch steel pipe pile	15	15	15
	24-inch AZ steel sheets	50	15	15

	12-inch steel H-piles	15	15	15

- The Corps must delay or shutdown all pile driving activities should an animal approach or enter the appropriate shutdown zone. The Corps may resume activities after one of the following conditions have been met: (1) the animal is observed exiting the shutdown zone; (2) the animal is thought to have exited the shutdown zone based on a determination of its course, speed, and movement relative to the pile driving location; or (3) the shutdown zone has been clear from any additional sightings for 15 minutes;
- The Corps will employ PSOs trained in marine mammal identification and behaviors to monitor marine mammal presence in the action area, and must establish the following monitoring locations: during vibratory driving, at least one PSO must be stationed on the shoreline near the Port of Garibaldi to monitor as much of the Level B harassment zone as possible, and another PSO must be stationed on the shoreline adjacent to the proposed MOF site to monitor the shutdown zone; during impact pile driving, two PSOs must be stationed on the shoreline adjacent to the proposed MOF site to monitor the shutdown zone. The Corps must monitor the project area to the maximum extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions. For all pile driving and removal at least two PSOs must be used;
- The placement of the PSOs during all pile driving and removal activities will ensure that the entire Level A harassment and shutdown zones are visible during pile installation and removal;
- Monitoring must take place from 30 minutes prior to initiation of pile driving (*i.e.*, pre-clearance monitoring) through 30 minutes post-completion of pile driving;

- If in-water work ceases for more than 30 minutes, the Corps will conduct pre-clearance monitoring of both the Level B harassment zone and shutdown zone;
- Pre-start clearance monitoring must be conducted during periods of visibility sufficient for the lead PSO to determine that the shutdown zones indicated in Table 10 are clear of marine mammals. Pile driving may commence following 30 minutes of observation when the determination is made that the shutdown zones are clear of marine mammals;
- Marine mammals observed anywhere within visual range of the PSO will be tracked relative to construction activities. If a marine mammal is observed entering or within the shutdown zones indicated in Table 10, pile driving must be delayed or halted. If pile driving is delayed or halted due to the presence of a marine mammal, the activity may not commence or resume until either the animal has voluntarily exited and been visually confirmed beyond the shutdown zone (Table 10), or 15 minutes have passed without re-detection of the animal;
- Vibratory hammers are the preferred method for installing piles at the MOF. If impact hammers are required to install steel piles, a confined bubble curtain must be used to minimize noise levels. The bubble curtain must adhere by the following restrictions:
    - The bubble curtain must distribute air bubbles around 100 percent of the piling circumference for the full depth of the water column;
    - The lowest bubble ring must be in contact with the substrate for the full circumference of the ring, and the weights attached to the bottom ring shall ensure 100 percent substrate contact. No parts of the ring or other objects shall prevent full substrate contact; and
    - Air flow to the bubblers must be balanced around the circumference of the pile;

- The Corps must use soft start techniques when impact pile driving. Soft start requires contractors to provide an initial set of three strikes at reduced energy, followed by a thirty-second waiting period, then two subsequent reduced energy strike sets. A soft start must be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of thirty minutes or longer. Soft starts will not be used for vibratory pile installation and removal. PSOs shall begin observing for marine mammals 30 minutes before “soft start” or in-water pile installation or removal begins;
- Pile driving activity must be halted upon observation of either a species for which incidental take is not authorized or a species for which incidental take has been authorized but the authorized number of takes has been met, entering or within the harassment zone;

Based on our evaluation of the applicant’s proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Proposed Monitoring and Reporting

In order to issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present while conducting the activities. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);

- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);

- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;

- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;

- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and,

- Mitigation and monitoring effectiveness.

Visual Monitoring

Monitoring must be conducted by qualified, NMFS-approved PSOs, in accordance with the following:

- PSOs must be independent (*i.e.*, not construction personnel) and have no other assigned tasks during monitoring periods. At least one PSO must have prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued IHA. Other PSOs may substitute other relevant experience, education (degree in biological science or related field), or training for prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued IHA. PSOs must be approved by NMFS prior to beginning any activity subject to these IHAs; and

- PSOs would be placed at two vantage points as aforementioned in the **Proposed Mitigation** section (see Figure 1-3 of the Corps' IHA Application) to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator;
- PSOs would use a hand-held GPS device or rangefinder to verify the required monitoring distance from the project site;
- PSOs would scan the waters within the Level A harassment and Level B harassment zones using binoculars (10x42 or similar) or spotting scopes (20-60 zoom or equivalent) and make visual observations of marine mammals present; and
- PSOs must record all observations of marine mammals, regardless of distance from the pile being driven. PSOs shall document any behavioral reactions in concert with distance from piles being driven or removed.

PSOs must have the following additional qualifications:

- Ability to conduct field observations and collect data according to assigned protocols;
- Experience or training in the field identification of marine mammals, including the identification of behaviors;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
- Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times

when in-water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior; and

- Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary;

Additionally, the Corps will have PSOs conduct one pinniped monitoring count a week prior to construction and report the number of marine mammals present within 500 m (1640 ft) of the Tillamook South Jetty or MOF. Upon completion of jetty repairs, PSOs would conduct two post-construction monitoring events, with one approximately 4 weeks after construction, and another at 8 weeks post construction. These post-construction marine mammal surveys would help to determine whether marine mammal detections post-construction were comparable to surveys conducted prior to construction.

Reporting

Draft marine mammal monitoring reports would be submitted to NMFS within 90 days after the completion of pile driving (Year 1 IHA) and removal activities (Year 2 IHA), or 60 days prior to a requested date of issuance of any future IHAs for projects at the same location, whichever comes first. The reports would include an overall description of work completed, a narrative regarding marine mammal sightings, and associated PSO data sheets. Specifically, the reports must include:

- Dates and times (begin and end) of all marine mammal monitoring;
- Construction activities occurring during each daily observation period, including the number and type of piles driven or removed and by what method (*i.e.*, impact or vibratory) and the total equipment duration for vibratory installation and removal for each pile or total number of strikes for each pile (impact driving);
- PSO locations during marine mammal monitoring;

- Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance;
- Upon observation of a marine mammal, the following information: Name of PSO who sighted the animal(s) and PSO location and activity at time of sighting; Time of sighting; Identification of the animal(s) (*e.g.*, genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species; Distance and bearing of each marine mammal observed relative to the pile being driven for each sighting (if pile driving was occurring at time of sighting); Estimated number of animals (min/max/best estimate); Estimated number of animals by cohort (adults, juveniles, neonates, group composition, sex class, etc.); Animal's closest point of approach and estimated time spent within the harassment zone; Description of any marine mammal behavioral observations (*e.g.*, observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (*e.g.*, no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching);
- Number of marine mammals detected within the harassment zones and shutdown zones, by species;
- Detailed information about any implementation of any mitigation triggered (*e.g.*, shutdowns and delays), a description of specific actions that ensued, and resulting changes in behavior of the animal(s), if any;
- Description of other human activity within each monitoring period;
- Description of any deviation from initial proposal in pile numbers, pile types, average driving times, etc.;

- Brief description of any impediments to obtaining reliable observations during construction period; and
- Description of any impediments to complying with these mitigation measures.

If no comments are received from NMFS within 30 days, the draft final reports would constitute the final reports. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments.

Reporting Injured or Dead Marine Mammals

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, the IHA-holder must immediately cease the specified activities and report the incident to the Office of Protected Resources (OPR) (*PR.ITP.MonitoringReports@noaa.gov*), NMFS and to the West Coast Regional Stranding Coordinator as soon as feasible. If the death or injury was clearly caused by the specified activity, the Corps must immediately cease the specified activities until NMFS is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the IHAs. The Corps must not resume their activities until notified by NMFS. The report must include the following information:

- Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
- Species identification (if known) or description of the animal(s) involved;
- Condition of the animal(s) (including carcass condition if the animal is dead);
- Observed behaviors of the animal(s), if alive;
- If available, photographs or video footage of the animal(s); and
- General circumstances under which the animal was discovered.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through harassment, NMFS considers other factors, such as the likely nature of any impacts or responses (*e.g.*, intensity, duration), the context of any impacts or responses (*e.g.*, critical reproductive time or location, foraging impacts affecting energetics), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS' implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

To avoid repetition, the discussion of our analysis applies to all the species listed in Table 2, given that the anticipated effects of this activity on these different marine mammal stocks are expected to be similar. There is little information about the nature or severity of the impacts, or the size, status, or structure of any of these species or stocks that would lead to a different analysis for this activity.

Pile driving activities associated with the Corps' proposed construction activities, as outlined previously, have the potential to disturb or displace marine mammals.

Specifically, the specified activities may result in take, in the form of Level B harassment (behavioral disturbance), and for some species, Level A harassment incidental to underwater sounds generated from pile driving. Potential takes could occur if individuals are present in zones ensonified above the thresholds for Level B harassment and Level A harassment, identified above, while activities are underway.

NMFS does not anticipate that serious injury or mortality would occur as a result of the Corps' planned activity given the nature of the activity, even in the absence of required mitigation. For all species and stocks, take would occur within a limited, confined area (adjacent to the project site) of the stock's range. Required mitigation is expected to minimize the duration and intensity of the authorized taking by Level A and Level B harassment. Further, the amount of take proposed to be authorized is extremely small for 4 of the 5 species when compared to stock abundance.

The primary method of installation will be vibratory pile driving. Vibratory pile driving produces lower SPLs than impact pile driving. The rise time of the sound produced by vibratory pile driving is slower, reducing the probability and severity of injury. Impact pile driving produces short, sharp pulses with higher peak levels and much sharper rise time to reach those peaks. If impact pile driving is used, implementation of soft start measures, a bubble curtain, and shutdown zones will significantly reduce any possibility of injury. Given sufficient notice through use of soft starts (for impact driving), marine mammals are expected to move away from a sound source prior to it becoming potentially injurious. The Corps will use two PSOs stationed strategically to increase detectability of marine mammals during pile installation and removal, enabling a high rate of success in implementation of shutdowns to avoid injury for most species. If an animal was exposed to accumulated sound energy, the resulting PTS would likely be small (*e.g.,* PTS onset) at lower frequencies where pile driving energy is concentrated, and unlikely to result in impacts to individual fitness, reproduction, or survival.

Additionally, and as noted previously, some subset of the individuals that are behaviorally harassed could also simultaneously incur some small degree of TTS for a short duration of time. Because of the small degree anticipated, though, any TTS potentially incurred here would not be expected to adversely impact individual fitness, let alone annual rates of recruitment or survival.

Behavioral responses of marine mammals to pile driving and removal in Tillamook Bay are expected to be mild, short term, and temporary. Marine mammals within the Level B harassment zones may not show any visual cues they are disturbed by activities or they could become alert, avoid the area, leave the area, or display other mild responses that are not observable such as changes in vocalization patterns or increased haul out time (Thorson and Reyff, 2006). Given that pile driving and removal would occur intermittently for only a short duration (20-23 days in Year 1 and 13 days in Year 2), often on nonconsecutive days, any harassment occurring would be temporary. Additionally, many of the species present in the region would only be present temporarily based on seasonal patterns or during transit between other habitats. These temporarily present species would be exposed to even smaller periods of noise-generating activity, further decreasing the impacts.

Effects on individuals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from other similar activities, will likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.*, Thorson and Reyff, 2006). Most likely, individuals will simply move away from the sound source and be temporarily displaced from the areas of pile driving, although even this reaction has been observed primarily only in association with impact pile driving, which will only be used if necessary. The pile driving activities analyzed here are similar to, or less impactful than, other construction activities conducted in Oregon, which have taken place with no known long-term adverse consequences from behavioral harassment. Level B harassment will be reduced to the level of least practicable adverse impact through use of mitigation measures described herein and, if sound produced by project activities is sufficiently disturbing, animals are likely to simply avoid the area while the activity is occurring.

The Corps' proposed activities are limited in scope spatially. While precise impacts would not be known until the MOF has been designed, based on an MOF built for a similar project (The Coos Bay North Jetty Maintenance project, *https://www.fisheries.noaa.gov/action/incidental-take-authorization-us-army-corps-engineers-north-jetty-maintenance-and-repairs*), it is estimated that temporary impacts below the high tide line (HTL) would be limited to 0.14 acres or less. The full extent of the MOF and associated access dredging would be approximately 3.6 acres, with an additional 3.7 acres of upland disturbance associated with the MOF staging area. For all species, there are no known habitat areas of particular importance (*e.g.*, Biologically Important Areas (BIAs), critical habitat, primary foraging or calving habitat) in the project area that would be impacted by the Corps' proposed activities. While takes may occur during important feeding or breeding times, the project area represents a small portion of available foraging and breeding habitat and impacts on marine mammal feeding and breeding for all species should be minimal. In general, cetaceans and pinnipeds are infrequent visitors near the site of the proposed construction activities due to shallow waters in this region further reducing the likelihood that cetaceans and pinnipeds will approach and be present within the ensonified areas. Further, none of the harassment isopleths block the entrance out of Tillamook Bay (see Figures 6-1 and 6-2 in the Corps' application), thus marine mammals could leave the bay and engage in foraging, social behavior or other activities without being subject to Level A or Level B harassment.

The impact of harassment on harbor seals is difficult to assess given the most recent abundance estimate available for this stock is from 1999 (Table 2). We are aware that there is one haul-out site located approximately 1.5 km (0.9 mi) east of the proposed construction site on an intertidal sand flat in the middle of the bay (see Figure 4-1 in the Corps' application) that has been historically noted in Tillamook Bay. Given the Level B harassment distances for vibratory installation and removal of 24-inch steel pipe piles and 24-inch AZ steel sheets are larger than 1.5 km (0.9 mi) (see Table 7), we can presume that some harbor seals will be repeatedly taken. In addition, while no there are no known pinniped haul outs on Bayocean split, harbor seals and other pinnipeds may be resting or hauled out on land near the site of the MOF construction, jetty rocks, or nearby beaches. Repeated, sequential exposure to pile driving noise over a long duration could result in more severe impacts to individuals that could affect a population; however, the limited number of non-consecutive pile driving days for this project means that these types of impacts are not anticipated.

The project also is not expected to have significant adverse effects on affected marine mammal habitat. The project activities would not modify existing marine mammal habitat for a significant amount of time. Any impacts on marine mammal prey that would occur during the Corps' planned activity would have, at most, short-term effects on foraging of individual marine mammals, and likely no effect on the populations of marine mammals as a whole. The activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammal foraging opportunities in a limited portion of the foraging range. However, because of the short duration of the activities and the small area of the habitat that may be affected, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences. Indirect effects on marine mammal prey during the construction are expected to be minor, and these effects are unlikely to cause substantial effects on marine mammals at the individual level, with no expected effect on annual rates of recruitment or survival.

In addition, it is unlikely that minor noise effects in a small, localized area of habitat would have any effect on the stocks' annual rates of recruitment or survival. In combination, we believe that these factors, as well as the available body of evidence from other similar activities, demonstrate that the potential effects of the specified activities would have only minor, short-term effects on individuals. The specified activities are not expected to impact rates of recruitment or survival and would, therefore, not result in population-level impacts.

In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect any of the species or stocks through effects on annual rates of recruitment or survival:

- No serious injury or mortality is anticipated or authorized;
- The number of total takes (by Level A and Level B harassment) are less than 2 percent of the best available abundance estimates for all but one stock;
- The Corps would implement mitigation measures including soft-starts and shutdown zones to minimize the numbers of marine mammals exposed to injurious levels of sound, and to ensure that take by Level A harassment is, at most, a small degree of PTS;
- Take would not occur in places and/or times where take would be more likely to accrue to impacts on reproduction or survival, such as within BIAs, or other habitats critical to recruitment or survival (*e.g.*, rookery);
- Take would occur over a short timeframe (*i.e.*, intermittently over up to 23 and 13 non-consecutive days in Year 1 and Year 2, respectively). This short timeframe minimizes the probability of multiple exposures on individuals, and any repeated

exposures that do occur are not expected to occur on sequential days, decreasing the likelihood of physiological impacts caused by chronic stress or sustained energetic impacts that might affect survival or reproductive success;

- Any impacts to marine mammal habitat from pile driving (including to prey sources as well as acoustic habitat, *e.g.*, from masking) are expected to be temporary and minimal; and

- Take would only occur within a small portion of Tillamook Bay—a limited, confined area of any given stock's home range.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds, specific to both the Year 1 and Year 2 proposed IHAs, that the total marine mammal take from the proposed activity will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is fewer than one-third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

The amount of take NMFS proposes to authorize is below one third of the estimated stock abundance for all but one species (in fact, take of individuals is less than 2 percent of the abundance of the 4 of the 5 affected stocks, see Tables 8 and 9). This is likely a conservative estimate because we assume all takes are of different individual animals, which is likely not the case. Some individuals may return multiple times in a day, but PSOs would count them as separate takes if they cannot be individually identified.

There is no current estimate of abundance available for this harbor seals (Carretta *et al*., 2021). In 1999, aerial surveys of harbor seals in Oregon and Washington were conducted by the National Marine Mammal Laboratory (NMLL) and the Oregon and Washington Departments of Fish and Wildlife (ODFW and WDFD) during the pupping season. After applying a correction factor to account for seals missed during aerial surveys (Huber *et al*., 2001), they estimated that the population size of the Oregon/Washington Coast Stock of harbor seals was 24,732 (CV = 0.12) in 1999. Historical and current trends of harbor seal abundance in Oregon and Washington are unknown. Based on the analyses of Jeffries *et al.* (2003) and Brown *et al.* (2005), both the Washington and Oregon portions of this stock were reported as reaching carrying capacity. While the proposed authorized take for harbor seals is 37.57 percent of the 1999 abundance estimate in Year 1 and 21.24 percent of this abundance in Year 2, harbor seals are not known to make extensive migrations and are known to display strong fidelity to haul out sites (Pitcher and Calkins, 1979; Pitcher and McAllister, 1981). Therefore, we presume that some of the harbor seals present in the action area will be repeatedly taken and actual number of individuals exposed to Level A and Level B harassment will be much lower. Further, we calculated proposed take estimates of harbor seals assuming the maximum seasonal abundance of individuals were present in Tillamook Bay during each action day; however, work may occur during other times of the year when harbor seal abundance is estimated to be lower, and thus the actual number of individuals exposed to Level A and Level B harassment would be lower. Lastly, take would occur in a small portion of Tillamook Bay and it is unlikely that a third of the stock would be in these waters during the short duration of the proposed activities.

Based on the analysis contained herein of the proposed activity (including the proposed mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS preliminarily finds, specific to both the Year 1 and Year 2 proposed IHAs, that small numbers of marine mammals would be taken relative to the population size of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species.

No incidental take of ESA-listed species is proposed for authorization or expected to result from these activities. Therefore, NMFS has determined that formal consultation under section 7 of the ESA is not required for this action.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue two IHAs to the Corps incidental to conducting repairs of the Tillamook South Jetty in Tillamook Bay, Oregon from November 1, 2022 to October 31, 2023 (Year 1 IHA) and from November 1, 2024 to October 31, 2025 (Year 2 IHA), provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. Drafts of the proposed IHAs can be found at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities.*

Request for Public Comments

We request comment on our analyses, the proposed authorizations, and any other aspect of this notice of proposed IHAs for the proposed construction activities. We also request comment on the potential renewal of these proposed IHAs as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform decisions on the request for these IHAs or a subsequent renewal IHA.

On a case-by-case basis, NMFS may issue a one-time, one-year renewal IHA following notice to the public providing an additional 15 days for public comments when (1) up to another year of identical or nearly identical activities as described in the **Description of Proposed Activities** section of this notice is planned or (2) the activities as described in the **Description of Proposed Activities** section of this notice would not be completed by the time the IHA expires and a renewal would allow for completion of the activities beyond that described in the *Dates and Duration* section of this notice, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to the needed renewal IHA effective date (recognizing that the renewal IHA expiration date cannot extend beyond one year from expiration of the initial IHA).
- The request for renewal must include the following:

(1) An explanation that the activities to be conducted under the requested renewal IHA are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.*, reduction in pile size) that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take).

(2) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

Upon review of the request for renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings in the initial IHA remain valid.

Dated: June 21, 2022.

Kimberly Damon-Randall,

Director, Office of Protected Resources,

National Marine Fisheries Service.

[FR Doc. 2022-13605 Filed: 6/24/2022 8:45 am; Publication Date: 6/27/2022]